Vol. I

TRANSCRIPT OF RECORD

Supreme Court of the United States

OCTOBER TERM, 1928

No. 365

ALBERT OTTINGER, AS ATTORNEY GENERAL OF THE STATE OF NEW YORK, APPELLANT,

vs.

KINGS COUNTY LIGHTING COMPANY

APPEAL FROM THE DISTRICT COURT OF THE UNITED STATES FOR THE EASTERN DISTRICT OF NEW YORK

FILED MAY 6, 1929

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IN UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF NEW YORK

In Equity. No. —

KINGS COUNTY LIGHTING COMPANY, Plaintiff,

against

WILLIAM A. PRENDERGAST, WILLIAM R. POOLEY, CHARLES Van Voorhis, Oliver C. Semple, and James A. Parsons, Constituting the Public Service Commission of the State of New York, and Carl Sherman, as Attorney-General of the State of New York, Defendants

BILL OF COMPLAINT

To the Judges of the District Court of the United States for the Eastern District of New York:

Kings County Lighting Company, a corporation duly organized and existing under and by virtue of the laws of the State of New York, having its principal place of business in the Borough of Brooklyn, City and State of New York, brings this its complaint against William A. Prendergast, William R. Pooley, Charles Van Voorhis, Oliver C. Semple and James A. Parsons, constituting the Public Service Com- [fol. 2] mission of the State of New York, and Carl Sherman, as Attorney-General of the State of New York, and thereupon plaintiff alleges:

1. Plaintiff was duly incorporated on the 26th day of May, 1904, under the Transportation Corporations Law of the State of New York, and since July 1st, 1904, has been and still is engaged in the business of manufacturing, furnishing and selling gas for public and private use in the territory comprising the 30th Ward and a small part of the 31st Ward of the Borough of Brooklyn, in the City of New York, which is a city containing a population of one million or over.

2. The Kings County Gas and Illuminating Company was incorporated December 17th, 1889, under and pursuant to

Chapter 40 of the Laws of 1848, and several acts amendatory thereof and supplementary thereto, and on or about December 26th, 1889, received the consent of the municipal authorities of the town of New Utrecht, Kings County, to lay conductors for conducting gas through the streets, lanes, alleys and squares in said town. Said Kings County Gas and Illuminating Company commenced supplying gas for public and private use in the town of New Utrecht, Kings County, on or about September 1st, 1891, and continued to supply the same until its merger with the plaintiff as hereinafter shown. Pursuant to the provisions of Chapter 451 of the Laws of 1894, the territory comprising the town of New Utrecht on July 1st, 1894, was added to the City of Brooklyn, as the 30th Ward thereof, and now is and since January [fol. 3] 1st, 1898, has been the 30th Ward of the Borough of Brooklyn, in the City of New York. Upon such annexation July 1st, 1894, the Kings County Gas and Illuminating Company became subject to the provisions of Section 70 of Chapter 566 of the Laws of 1890, fixing $1.25 per thousand cubic feet as the maximum price of gas in cities of the first class.

3. On July 1st, 1904, plaintiff then being the owner of all the issued and outstanding capital stock of the Kings County Gas and Illuminating Company, duly merged into and with itself said Kings County Gas and Illuminating Company in accordance with the provisions of the Stock Corporation Law of the State of New York, and thereupon acquired and became and since has been possessed of all the estate, property, rights, privileges and franchises thereof.

4. Plaintiff owns a valuable piece or parcel of land bounded on the east by First Avenue, on the north by the center line of 54th Street extended, on the west by New York Bay, and on the south by the center line of 55th Street extended, in the Borough of Brooklyn, on which is located its manufacturing works equipped for the manufacture of carburetted water gas having seven generators with a combined rated capacity of 17,400,000 cubic feet of gas per twenty-four hours. Plaintiff also is the owner of another valuable piece or parcel of land at 9th Avenue and 65th Street, in the Borough of Brooklyn, on which are located its shops and its gas holders, having a storage capacity of

2,500,000 cubic feet of gas, which are connected with its manufacturing works by a 20-inch high pressure transmis- [fol. 4] sion main one and one-half miles in length. Plaintiff has approximately 204 miles of gas mains laid in the streets, avenues and public places of said 30th and 31st Wards, with 26,000 service pipes connected and has installled on the premises of consumers 50,200 gas meters. Its said mains are connected with 1,604 street lamps maintained by the City of New York, through which it furnishes gas for street lighting.

5. The territory served by plaintiff is entirely a suburban community still in the process of development for residential purposes, with a present population of approximately 300,000. Due to the constant growth and development of said territory and the more extended use of gas for domestic purposes, there has been an increase from year to year in the consumption of gas furnished by the plaintiff, which has required plaintiff to increase its manufacturing facilities, extend its mains for the distribution of gas and instal- additional services and meters each year. The annual consumption of gas by private consumers of plaintiff has increased over 50% in the past five years. In the year 1917, plaintiff had 34,835 private consumers, who used 977,119,372 cubic feet of gas, and in 1922, plaintiff had 48,809 private consumers who used 1,491,204,000 cubic feet.

6. Prior to September 2nd, 1916, plaintiff furnished the gas and maintained the street lamps for lighting the streets of said 30th Ward under the provisions of two contracts, dated respectively December 26th, 1889, and March 19th, 1891, made between the Kings County Gas and Illuminating Company and the Board of Improvement of the former [fol. 5] town of New Utrecht. Since the termination of said contracts on September 2nd, 1916, plaintiff has supplied gas to the City of New York for street lighting at the price of 75 cents per thousand cubic feet, as fixed by Chapter 736 of the Laws of 1905. Plaintiff also supplies gas to the City of New York for use in municipal buildings at the rate of 75 cents per thousand cubic feet, likewise fixed by said statute. The amount of gas supplied to the City of New York is only about 2% of plaintiff's total sales, in the year 1922 amounting to 31,709,035 cubic feet.

7. On information and belief, the present fair value of plaintiff's plant and property used in the public service exceeds the sum of $8,500,000, exclusive of franchises and going value. The going value of such a plant with upwards of 50,000 consumers, using annually upwards of 1,500,000,000 cubic feet of gas, is not less than $1,000,000. At the time of the merger by plaintiff of the Kings County Gas and Illuminating Company on July 1st, 1904, as aforesaid, the said Kings County Gas and Illuminating Company owned the lands hereinbefore described, had a manufacturing works and distributing system supplying approximately 5,000 private consumers, and was lighting the streets and highways of the 30th Ward under the aforesaid contracts made between it and the Board of Improvement of the former town of New Utrecht. Since July 1st, 1904, plaintiff has expended for additions, extensions and improvements to said plant and property the sum of $3,660,709.02.

[fol. 6] 8. Plaintiff has issued and outstanding $2,000,000 of common capital stock, divided into 20,000 shares of the par value of $100 each, and $370,000 of 8% cumulative preferred stock, divided into 3,700 shares of the par value of $100 each. It has issued and outstanding in the hands of the public $750,000 of its first mortgage 5% bonds, due October 1st, 1940, secured by a mortgage made by said Kings County Gas and Illuminating Company to the Peoples Trust Company of Brooklyn, as trustee, dated October 1st, 1890, and $4,211,000 of first refunding mortgage bonds due July 1st, 1954, secured by its mortgage to the Central Union Trust Company of New York, as trustee, dated July 1st, 1904. $1,822,000 of said first refunding mortgage bonds bear interest at the rate of 6½%, and $2,389,000 thereof bear interest at the rate of 5%.

9. An act of the Legislature of the State of New York, being Chapter 125 of the Laws of 1906, taking effect May 1st, 1906, provided that a corporation engaged in the business of manufacturing, furnishing or selling illuminating gas in the territory served by plaintiff, should not charge or receive for gas manufactured, furnished or sold a sum per thousand cubic feet in excess of one dollar. Plaintiff on July 1st, 1914, reduced its charge for gas to private con-

sumers from $1 to 95 cents per thousand cubic feet. An act of the Legislature of the State of New York, being Chapter 604 of the Laws of 1916, amending said Chapter 125 of the Laws of 1906, taking effect July 1st, 1916, provided that a corporation engaged in the business of manufacturing, [fol. 7] furnishing or selling illuminating gas in the territory served by plaintiff, should not charge or receive for gas manufactured, furnished or sold therein a sum per thousand cubic feet in excess of 80 cents.

10. Heretofore, and in or about the month of July, 1916, plaintiff commenced in the Supreme Court of the State of New York, for the County of New York, an action to enjoin the enforcement of said chapter 604 of the laws of 1916, on the ground that the 80 cent rate prescribed was confiscatory. Said action resulted in a judgment entered March 29th, 1920, dismissing plaintiff's complaint, which judgment on appeal was reversed and judgment entered in said action on the 10th day of August, 1922, declaring said statutory rate confiscatory, and restraining and enjoining the enforcement of said amendatory statute, and such judgment of reversal was affirmed by the Court of Appeals of the State of New York on April 17, 1923. Pending the appeal from the aforesaid judgment and on or about the 24th day of May, 1920, plaintiff commenced in the District Court of the United States for the Southern District of New York, a suit to enjoin the enforcement of, and to have declared unconstitutional and void, said chapter 125 of the laws of 1906, as amended by said chapter 604 of the laws of 1916. Such proceedings were thereafter duly had in said suit that on or about the 20th day of October, 1920, a decree was made and entered therein, declaring that chapter 125 of the laws of 1906 and chapter 604 of the laws of 1916, in so far as such statutes, or either of them, limited the rate to be charged for gas supplied by plaintiff in the territory served by it were confiscatory, unconstitutional and void, and en- [fol. 8] joining and restraining the enforcement thereof. Such decree was thereafter and on or about the 6th day of March, 1922, affirmed by the Supreme Court of the United States.

11. After the entry of the decree in said suit and on or about the 23rd day of October, 1920, plaintiff increased its

rate or charge for gas from 95 cents to $1.50. On May 1st, 1922, plaintiff reduced said rate or charge to $1.40 per thousand. Thereafter and by order dated August 30, 1922, the Public Service Commission of the State of New York, defendant herein, under the authority vested in it to fix and establish rates for gas supplied notwithstanding that another or different rate was fixed by statute, fixed and established $1.30 per thousand cubic feet as the maximum rate or charge for gas supplied by the plaintiff from and after the 1st day of November, 1922, for the period of one year and until otherwise ordered by said Commission. No other or further order or direction with respect to the rate to be charged by the plaintiff has been made by such Public Service Commission, and the plaintiff since November 1st, 1922, under provisions of the Public Service Commission law and orders of the Public Service Commission has charged, and is now charging the rate so fixed by said order dated August 30th, 1922.

12. An act of the Legislature of the State of New York, approved by the Governor of said state June 2, 1923, and taking effect immediately, being Chapter 899 of the Laws of 1923, entitled

"An Act to amend the public service commission law, in relation to the charge for illuminating gas in cities contain-[fol. 9] ing a population of one million or over,"

amended the Public Service Commission Law of the State of New York, being chapter 480 of the laws of 1910, by inserting therein a new section to be known as Section 67-a reading as follows:

§67-a. Charge for gas in cities of one million or more. A gas corporation engaged in the business of manufacturing, furnishing or selling illuminating gas in a city containing a population of one million or over shall not charge or receive for gas furnished or sold in such city a sum per one thousand cubic feet in excess of one dollar, nor furnish in such city gas of a standard less than six sundred and fifty British thermal units per cubic foot, measured under normal conditions of temperature and atmospheric pressure. The public service commission, notwithstanding any other provision of this chapter, shall not allow a rate or charge in the case of such cities in excess of such sum."

13. The rate of $1. per thousand cubic feet prescribed by said chapter 899 of the laws of 1923, is unreasonable and confiscatory, and the enforcement of such statute against plaintiff will deprive it of its property without due process of law. Said statute is in violation of section 10 of Article 1 of the Constitution of the United States, in that it impairs the obligation of plaintiff's contractual rights and is also in violation of the Fourteenth Amendment to the Constitution of the United States in that the enforcement thereof will deprive plaintiff of its property without due process of law, take its property without just com-[fol. 10] pensation and deny to it the equal protection of the law.

14. In the calendar year 1922 plaintiff manufactured 1,845,870,000 cubic feet of gas, and its sales were 1,525,829,435 cubic feet. The actual total cost to plaintiff, including the expenses incident to the sale of gas appliances, of manufacturing and distributing gas manufactured and sold as aforesaid was $1,668,308.42. Plaintiff's gross profit from the sale of gas appliances was $59,129.38, which is more than the expense incident to such sales, but deducting the whole of such gross profit from the actual cost aforesaid, the net cost to plaintiff of manufacturing and distributing gas in the year 1922 was $1,609,179.04, or $1.0546 per thousand cubic feet of gas sold. The operating expenses aforesaid include only the cost of materials, supplies, labor and taxes incurred by plaintiff in making and distributing said gas. There is no charge therein for so-called depreciation. The only charge made over and above the actual expense for repairs is 3 cents per thousand cubic feet of gas sold to provide for renewals and replacements of fixed capital or plant withdrawn from service, aggregating $45,951.55. Such expenses include no item which is not a proper charge to operation. They do not include any charge or expenditure by the plaintiff for interest upon its bonds, temporary loans, or other indebtedness, and include no return upon the capital or property employed in any form whatsoever.

15. In 1922 plaintiff used 5,483,080 gallons of gas oil, or 2.97 gallons per thousand cubic feet of gas made, which gas oil, including the handling charges, cost plaintiff $501,-[fol. 11] 043.82, or 32.83 cents per thousand cubic feet of gas

sold. It requires not less than 4.65 gallons of gas oil per thousand cubic feet of gas made to produce gas of a minimum of 650 British thermal units, or 1.68 gallons more per thousand cubic feet of gas made than that used by plaintiff in 1922. To furnish gas of 650 British thermal units equivalent to the quantity of gas made in 1922 would require 8,583,295 gallons of gas oil, which at plaintiff's present contract price of 5.25 cents per gallon, plus handling charges, would cost $451,052.15, or 29.57 cents per thousand cubic feet of gas sold, which is 3.26 cents less than the cost of gas oil in 1922 and makes the cost of manufacturing and distributing 650 British thermal units gas $1.022 per thousand cubic feet of gas sold without any return upon capital or property. The increase in the heat content of gas is effected through the use of additional gas oil without a reduction in other materials used or a saving in labor or other manufacturing expense.

16. There has been no reduction in the cost of manufacturing and distributing gas from the cost of 1922, except in the price of gas oil which plaintiff is obtaining at the present time at 5.25 cents per gallon. On the contrary the tendency is toward an increase in cost of manufacture. To manufacture and distribute 650 British thermal unit gas, including taxes, in the current year, at current prices, will cost plaintiff not less than $1 per thousand cubic feet without any return upon the capital or property employed in the service.

[fol. 12] 17. Through the normal increase in the population of the territory served by plaintiff an average of 2,000 consumers have been added annually for the last fifteen years and 7,000 consumers have been added in the past sixteen months. Owing to the present shortage in housing facilities a pronounced impetus has been given to building operations in said territory, which is one of the most rapidly growing sections of New York City. There are now under construction over 1,100 private houses and apartments, calculated to accommodate between 4,000 and 5,000 families. During the current year plaintiff will be called upon to furnish gas to more than 6,000 additional consumers. The new residences constructed and now in process of construction are equipped for the use of gas for

cooking, and in many of them no flue is installed, which is necessary for the use of any other fuel, except gas. Plaintiff is the only corporation supplying gas in the territory, and unless it is able to supply service to such premises, they must remain unoccupied and the investment therein remain idle to the great loss of the owners and investors. Unless plaintiff can secure new capital it will be unable to make the necessary increases in its plant facilities to serve such new consumers, and it cannot secure any new capital unless it is able to show prospects of a fair and reasonable return not only upon the capital employed, but upon the new capital sought. If the rate of $1 per thousand cubic feet of gas fixed by said chapter 899 of the laws of 1923 is put in effect and enforced, the result will be disastrous to plaintiff, depriving it of a reasonable, or any, return upon the value of its property, and making it im- [fol. 13] possible to find a market for the securities plaintiff must issue and sell in order to provide funds with which to make the improvements, additions and betterments which are necessary if it is to furnish proper and adequate services to the community in which it operates.

18. Since October 1, 1922, plaintiff has supplied gas in compliance with an order of the Public Service Commission of the State of New York dated August 30, 1922, fixing a monthly average of 537 British thermal units per cubic foot and a minimum of 525 British thermal units per cubic foot. At no time since January 1, 1918, has plaintiff furnished gas of more than 600 British thermal units per cubic foot. The gas-consuming appliances of plaintiff's consumers are now adjusted to utilize economically and efficiently gas of an average of 537 British thermal units per cubic foot. Such gas-consuming appliances without readjustment or new parts cannot utilize efficiently or without danger to life, gas of 650 British thermal units per cubic foot, as prescribed by said chapter 899 of the laws of 1923. If plaintiff should send into its mains gas containing as much as 650 British thermal units per cubic foot with its consumers' appliances adjusted as they now are, incomplete combustion would result, with the release of poisonous gases injurious to the lives and health of its consumers and their families. Not until all of plaintiff's consumers procure suitable new appliances, or adjust existing appliances,

can plaintiff safely furnish or supply gas of 650 British thermal units per cubic foot. Great difficulty would be ex- [fol. 14] perienced by plaintiff's consumers in an attempt either to secure new appliances or to adjust existing appliances to utilize said gas. To properly adjust existing appliances would require a reduction of the gas orifice, which in many instances cannot be done. Appliances suitable for 650 British thermal units are not on the market because nowhere in this country is gas of as high a heat content as 650 British thermal units used. Manufacturers supply the demand that exists for gas appliances suitable for a maximum of 600 British thermal units, which are easily adjusted downward for the utilization of 525 British thermal unit gas, the standard extensively in use.

19. The provision of said chapter 899 of the laws of 1923, requiring the furnishing of gas of a standard of not "less than 650 British thermal units per cubic foot, measured under normal conditions of temperature and atmospheric pressure," is arbitrary and unreasonable, and deprives plaintiff of its property without due process of law, and amounts to the taking of plaintiff's property without compensation, and is an undue interference with the right and liberty of contract between plaintiff and its consumers. Efficient service can only be rendered plaintiff's consumers by supplying them with a gas of a substantially uniform heat content. It is impossible to furnish gas of a substantially uniform heat content of 650 British thermal units per cubic foot as the natural variations in the temperature and pressure of the gas as it is distributed through the territory cause a variation in the heat content of the gas to which gas of such a high heat content is peculiarly subject. In [fol. 15] the nature of things plaintiff's consumers cannot adjust and readjust their appliances to meet the varying heat content of such a gas, and the result is inefficient service and consequent dissatisfaction on the part of plaintiff's consumers, engendering a prejudice among plaintiff's consumers against the plaintiff over a situation beyond its control. Even under a rate fully compensatory for the additional expense entailed in the furnishing of such a gas, plaintiff would suffer irreparable injury and damage in the loss of the good-will of its consumers. The impossibility of furnishing gas of a substantially uniform heat con-

tent of 650 British thermal units per cubic foot exposes plaintiff to a multiplicity of actions for the recovery of penalties for a violation of the statute, and to a multiplicity of proceedings by mandamus and injunctions for the enforcement thereof, and to proceedings before the Public Service Commission, involving its alleged non-compliance with the statute, to the great and irreparable damage and injury of the plaintiff for which it has no adequate remedy at law or otherwise than in this suit.

20. Defendants, William A. Prendergast, William R. Pooley, Charles Van Voorhis, Oliver C. Semple, and James A. Parsons, constitute the Public Service Commission of the State of New York and are now acting as such commission, each of them having been duly appointed under and by virtue of the provisions of chapter 48 of the Consolidated Laws of the State of New York, and each of said defendants resides in and is a citizen of the State of New [fol. 16] York, and at least one of them is a resident in the Eastern District of New York.

21. Defendant, Carl Sherman, is the Attorney-General of the State of New York and resides in and is a citizen of the State of New York.

22. Under the statutes of the State of New York, said Public Service Commission of the State of New York may institute suits for mandamus or for injunction against the plaintiff, to prevent the violation of any provision of the Public Service Commission law of the State of New York, and said Public Service Commission and the defendant, Carl Sherman, as Attorney-General of the State of New York, under said statutes may prosecute plaintiff for a violation of such statutes, and endeavor to enforce and collect the penalties prescribed for their violation. On information and belief, the defendants or some of them will attempt to enforce or have enforced against plaintiff said chapter 899 of the laws of 1923 unless they are enjoined from enforcing said statute. Plaintiff has no adequate remedy at law against the enforcement thereof and the injury and damage to plaintiff from its enforcement is and will be irreparable. Unless the defendants be restrained from enforcing said statute, plaintiff will be sub-

jected to a multitude of actions and proceedings brought to secure its enforcement. The penalties prescribed for its violation are so oppressive and burdensome and will amount to such a sum in the aggregate as to result in the entire destruction and confiscation of plaintiff's property. The amount in controversy herein greatly exceeds the sum of $3,000, exclusive of interest and costs.

[fol. 17] Wherefore plaintiff prays that it be adjudged and decreed, (1) that said chapter 899 of the laws of 1923 is void and unconstitutional and is in contravention of Section 10 of Article 1 and the Fourteenth Amendment to the Constitution of the United States; (2) that the enforcement of said statute in respect to the rate to be charged for gas furnished by plaintiff be suspended and restrained; (3) that the enforcement of said statute in respect to the quality or standard of gas to be supplied by plaintiff be suspended and restrained; (4) that the defendants, and each of them, their and each of their successors, deputies, assistants and employees be restrained and enjoined from enforcing the provisions of said chapter 899 of the laws of 1923, or any part thereof, and from instituting or causing to be instituted any suit, action or proceeding to enforce the said statute, or any provision thereof.

And further, plaintiff prays that during the pendency of this suit an interlocutory injunction issue suspending and restraining the enforcement of said statute, and for such other, further or different relief as to the Court may seem just and equitable.

And may it please your Honors to grant unto plaintiff a writ of subpœna to issue out of and under the seal of this Court, directed to the said William A. Prendergast, William R. Pooley, Charles Van Voorhis, Oliver C. Semple, and James A. Parsons, constituting the Public Service Commission of the State of New York, and to the said Carl [fol. 18] Sherman, as Attorney-General of the State of New York, commanding them and each of them at a certain time therein to be named, and under a certain penalty therein to be limited, to be and appear before this Court there and then to answer unto this complaint and perform and abide by such order and decree in the premises as to this Honor-

able Court shall seem meet and be required by the principles of equity and good conscience.

Ingraham, Page & Moran, Solicitors for Plaintiff. Office and Post-Office address: 14 Wall Street, Borough of Manhattan, City of New York. Alfred R. Page, Samuel F. Moran, Travis H. Whitney, John D. Monroe, Counsel.

[fols. 19 & 19a] *Duly sworn to by Paul Bucher. Jurat omitted in printing.*

[fol. 20] IN UNITED STATES DISTRICT COURT

[Title omitted]

ANSWER OF ATTORNEY GENERAL

The defendant, Carl Sherman, as Attorney General of the State of New York, for his answer to the bill of complaint herein alleges:

First. Denies that he has any knowledge or information thereof sufficient to form a belief as to each and every allegation contained in the paragraphs of said bill of complaint marked and numbered "3," "4," "5," "6," "7," "8," "11," "14," "15" and "17".

Second. That upon information and belief the defendant denies each and every allegation contained in the paragraphs of the bill of complaint thereof marked and numbered "13," "16," "18" and "19".

[fol. 21] Third. The defendant admits that on or about the 1st day of July, 1916, the plaintiff commenced an action in the Supreme Court of the State of New York to have adjudged and decreed that Chapter 604 of the Laws of 1916 as alleged in paragraph marked and numbered "10" was confiscatory as to it and that upon the trial thereof the complaint in the said action was dismissed and that such determination was reversed and that such reversal was affirmed by the Court of Appeals of the State of New York on April 17, 1923. Further the defendant admits that on or about the 24th day of May, 1920, the plaintiff began an action in

the District Court of the United States for the Southern District of New York for the purpose of having declared unconstitutional and void said Chapter 604 of the Laws of 1916 and that the plaintiff succeeded in its said last-named action and the decree of the United States District Court therein was affirmed by the Supreme Court of the United States on the 6th day of March, 1922. That the defendant denies that he has any knowledge or information sufficient to form a belief as to each and every other allegation contained in said paragraph so marked and numbered.

Fourth. The defendant admits that under the statutes of the State, the Public Service Commission of the State of New York may institute suits for mandamus or injunction against the plaintiff to prevent the violation by the plaintiff of any law of the State or any order of the Commission issued with respect to the public utility companies over which said Commission takes jurisdiction and may for the refusal of the plaintiff to obey the order of the Commission, bring a suit for the recovery of penalties forfeited to the people of said State but the said defendant denies that he has any knowledge or information sufficient to form a belief as to each and every other allegation contained in the para- [fol. 22] graph of the bill of complaint marked and numbered "22".

Fifth. The defendant further alleges by way of answer to the bill of complaint herein upon information and belief that the plaintiff does not operate its business in a careful and efficient manner and does not practice reasonable economies in the purchase of its coal, gas oil and other materials used in the manufacturing of gas and that cheaper and more available forms of fuel for the purpose of such manufacture may be obtained by the said plaintiff as a substantial reduction in the present cost of manufacture of its product. That further the said plaintiff does not keep its books of account in compliance with an order issued by the Public Service Commission aforesaid which requires the said plaintiff to keep such books in accordance with a system known as the Uniform System of Accounts. That by reason thereof and the inadequacy of the force of employers under the direction and control of the said Commission, the Public Service Commission and the public do not and cannot

readily ascertain the cost to the said plaintiff of the manufacture and distribution of its product.

Sixth. That the defendant further answering the bill of complaint herein, alleges affirmatively, upon information and belief, that the said rate of $1.00 per thousand cubic feet, and the standard of quality of 650 British Thermal Units per cubic foot fixed by said Chapter 899 of the Laws of 1923, constitute together a fair, reasonable and valid enactment by the Legislature of the State of New York, is a constitutional regulation by the said Legislature, does not exclude the said plaintiff from the equal protection of the laws, nor is the said Act in any respect violative of any of the provisions of the Constitution of the United States. Further, the defendant is informed and verily believes that [fol. 23] the said fixation by the Legislature of the standard of quality of 650 British Thermal Units per cubic foot for gas sold in the City of New York is exclusively within the scope of the legislative power of the State of New York and that the judicial power of the Federal Government has no jurisdiction or control in the premises.

Seventh. That the defendant, further answering the bill of complaint herein, and in addition to the denials interposed to paragraph marked and numbered "11" thereof, alleges affirmatively upon information and belief that the standard of quality of gas fixed by the said Public Service Commission, and the rates concurrently fixed thereby together constitute an unreasonable charge for gas service in the City of New York, and that the said fixation by said Commission of said quality of gas was by a reduction in the quality thereof from that having a heat content on an average of 650 British Thermal Units per cubic foot, to that of 537 British Thermal Units per cubic foot, now results and has resulted in making the cost of gas service to the consumers of the plaintiff excessive, unreasonable and more than necessary to compensate the said plaintiff for its public service, as well as to pay all of its reasonable operating expenses, its taxes and to pay a fair return upon a fair valuation of the investment of the said plaintiff engaged in such public service.

Eighth. That the defendant is informed and verily believes that the said plaintiff has made no experimentation

with the rate or standard of quality of gas fixed by the legislature of the State of New York in chapter 899 of the Laws of 1923 of said state and has no information or knowl- [fol. 24] edge upon which to base its conclusion as set forth in the bill of complaint as to the cost to it of the manufacture and distribution of gas of 650 British Thermal Units per cubic foot based on the rate of $1.00 per thousand cubic feet.

Wherefore the defendant prays that the bill of complaint herein be dismissesd with costs.

Carl Sherman, Attorney General of the State of New York. James A. Donnelly, Solicitor for the Attorney General.

Office and Post Office address: 51 Chambers Street, Borough of Manhattan, City of New York.

[fol. 25] IN UNITED STATES DISTRICT COURT

[Title omitted]

ANSWER OF DEFENDANTS WILLIAM A. PRENDERGAST ET AL., CONSTITUTING THE PUBLIC SERVICE COMMISSION

The above named defendants, William A. Prendergast, William R. Pooley, Charles Van Voorhis, Oliver C. Semple and James A. Parsons, constituting the Public Service Commission of the State of New York, by Ledyard P. Hale, their Solicitor, answer the Bill of Complaint herein as follows:

I

These defendants, answering Paragraph 1 of plaintiff's complaint, admit the allegations thereof.

[fol. 26] II

These defendants, answering Paragraphs 2 and 3 of plaintiff's complaint, are without knowledge as to the allegations therein contained and therefore deny the same.

III

These defendants, answering Paragraphs 4, 5 and 6 of plaintiff's complaint, admit that the plaintiff is engaged in the business of manufacturing, furnishing and selling gas in the Borough of Brooklyn, and that its manufacturing works are located in the Borough of Brooklyn with gas mains laid in the streets, avenues and public places of said Borough of Brooklyn. As to the other allegations contained in Paragraphs 4, 5 and 6 of plaintiff's complaint, these defendants are without knowledge and therefore deny the same.

IV

These defendants, answering Paragraph 7 of plaintiff's complaint, deny, upon information and belief, the allegations therein contained, and further deny that the plaintiff is possessed of going value, or other intangible assets, of the value of $1,000,000.00, or of any value, and deny that the present fair value of plaintiff's plant and property used in the public service, exclusive of franchises and going value, is the sum of $8,500,000.00, or any amount in excess of $7,765,105.06. These defendants are without knowledge as to the amounts the plaintiff alleges that it has expended for additions, extensions and improvements to its plant and property since July 1, 1904, and therefore deny the same.

[fol. 27]

V

These defendants, answering Paragraph 8 of plaintiff's complaint, admit, on information and belief, the allegations therein contained.

VI

These defendants, answering Paragraphs 9, 10 and 11 of plaintiff's complaint, admit the allegations therein contained, except these defendants allege that said orders of said Public Service Commission of August 30, 1922, prescribing classifications and rates to be charged for gas, as in plaintiff's complaint set forth, were based upon facts found by the Commission in its said investigations and hearings, and that the Commission found on the date each

said order was made that said rates so fixed were just and reasonable rates to be charged by the plaintiff to its consumers in the Borough of Brooklyn, and in the said opinion filed by the said Commission contemporaneously with the making and entering of said orders it was stated and determined by the Commission that said rates and classifications of service so fixed should be established to be effective for one year from the 1st day of November, 1922, and to continue in force until the 30th day of October, 1923, and thereafter until the Commission should otherwise order.

VII

These defendants admit the enactment of Chapter 899 of the Laws of 1923, as alleged in Paragraph 12 of plaintiff's complaint, and allege that on or about the 4th day of June, 1923, said Public Service Commission of the State of New York duly served on the plaintiff an order as follows:

[fol. 28] "STATE OF NEW YORK, PUBLIC SERVICE COMMISSION

At a Session of the Public Service Commission Held in the City of Albany on the 4th Day of June, 1923

Present: William A. Prendergast, Chairman; Charles Van Voorhis, Oliver C. Semple, James A. Parsons, Commissioners.

Case No. 1360

In the Matter of Rates to be Charged for Gas in the City of New York

The Commission having under consideration the provisions of Chapter 899 of the Laws of 1923 in relation to charges for gas in cities of over one million inhabitants;

Ordered: That each and every gas corporation engaged in the business of manufacturing, furnishing or selling illuminating gas in the City of New York be and hereby is required forthwith to comply with such statute, and be and hereby is authorized to file and publish a new schedule of its rates for gas effective forthwith in accordance with said statute.

Further Ordered: That the Secretary serve by mail forthwith a copy of this order on every such gas corporation.

By the Commission.

(Signed) Harry M. Ingram, Acting Secretary."
(Seal.)

[fol. 29]

VIII

These defendants, answering Paragraphs 13, 14, 15, 16, 17, 18 and 19 of plaintiff's complaint, deny, upon information and belief, each and every allegation therein contained, except that in pursuance of and in compliance with the requirements of the said order of the said Public Service Commission of August 30, 1922, hereinbefore referred to, the plaintiff proceeded to effect changes in the adjustment of various gas appliances used by plaintiff's consumers in order to comply with the terms and conditions of said order and to adapt said consumers' gas appliances to the safe and efficient use of gas of the standard prescribed by the said order of said Commission.

IX

These defendants, answering Paragraphs 20 and 21 of plaintiff's complaint, admit the allegations therein contained.

X

These defendants, answering Paragraph 22 of plaintiff's complaint, deny that plaintiff can only obtain relief in a court of equity and that the interposition of the power of a court of equity is necessary in any manner or at all to protect the alleged rights of plaintiff or plaintiff's property herein, against any action which can be taken by these defendants under and pursuant to the statutes of the State of New York.

Wherefore, These defendants pray that the Bill of Complaint herein be dismissed with costs; and said defendants [fol. 30] pray for such other relief in the premises as to the

Honorable Court may seem meet and in accordance with equity.

Ledyard P. Hale, Solicitor for Defendants, 91 State State, Albany, N. Y. Charles G. Blakeslee, Edward M. Deegan, Sherman C. Ward, of Counsel.

[fol. 31] In United States District Court

Notice of Order Appointing Special Master

Sir: Please take notice that the within is a true copy of an order made herein and entered in the office of the Clerk of the United States District Court for the Eastern District of New York on the 11th day of October, 1923.

New York, October 15th, 1923.

Yours, etc., Ingraham, Page & Moran, Solicitors for Plaintiff, 14 Wall Street, Borough of Manhattan, New York City.

To Charles G. Blakeslee, Esq., Solicitor for Defendant Public Service Commission; Hon. Carl Sherman, Attorney General; James A. Donnelly, Esq., Solicitor for Defendant Sherman, as Attorney General.

[fol. 32] In United States District Court

[Title omitted]

Order Appointing Special Master—October 11, 1923

Issue having been joined in this case by the filing of the answers of the above-named defendants and the plaintiff having moved for the appointment of a Special Master herein,

Now on motion of Ingraham, Page & Moran, solicitors for the plaintiff, it is

Ordered:

1. That Almeth W. Hoff be and he is hereby appointed Special Master to take the testimony and evidence upon the issues herein, make all needed computations and fully

hear the facts and report to the Court his findings of fact and conclusions of law, together with the evidence for the advisement of the Court; provided that nothing herein [fol. 33] contained shall be construed as meaning that the Special Master's findings of fact shall be final but only that he shall find the facts for the purpose of aiding the Court and making his recommendations. The Special Master shall, before submitting to this Court his final report, prepare and serve on the solicitors for the respective parties hereto a draft of such report.

Enter.

Marcus B. Campbell, U. S. D. J.

[fols. 33a & 33b] Copy received Oct. 15 '23.

James A. Donnelly, Solicitor for Defendant. Carl Sherman, Attorney General.

[fol. 34] In United States District Court

[Title omitted]

Opinion of the Special Master.—Filed April 20, 1925

This is a suit in equity brought by the plaintiff challenging the constitutionality of an Act of the Legislature of the State of New York, known as Chapter 899 of the Laws of 1923, relating to the price and quality of gas furnished in cities of one million or more.

The plaintiff is one of the corporations affected by the said Act and the defendants are public officers charged with duties in respect to the enforcement thereof.

[fol. 35] Upon the institution of the suit, the plaintiff applied for and obtained from the Court an injunction pendente lite.

Appearances:

Samuel F. Moran (Samuel F. Moran, John D. Monroe, Travis H. Whitney, and Robert H. Grimes, of Counsel), solicitor for plaintiff.

Charles G. Blakeslee (Sherman C. Ward, of Counsel), Solicitor for Defendants William A. Prendergast, William

R. Pooley, Charles Van Voorhis, George R. Lunn, and George R. Van Namee, constituting the Public Service Commission of the State of New York.

James A. Donnelly (Judson Hyatt, of Counsel), Solicitor for Carl Sherman, as Attorney-General of the State of New York.

John Holley Clark, Jr. (Anthony P. Luddon, of Counsel), Solicitor for Albert Ottinger, substituted for Carl Sherman, as Attorney-General of the State of New York.

This action was referred to me, as Special Master, by an order of Hon. Marcus B. Campbell, United States District Judge for the Eastern District of New York, dated October 11, 1923, directing me to take the testimony and evidence upon the issues herein, make all needed computations and fully hear the facts and report findings of fact and conclusions of law, together with the evidence.

[fol. 36] In accordance with the order and following conferences with the District Judge, for the purpose of arranging hearings so as not to conflict with sessions in other like cases, it was agreed that hearings should be held two days a week, and in accordance therewith and by agreement of counsel, hearings were begun on December 4, 1923, and continued until June 10, 1924, in which there were taken more than 4,000 typewritten pages of testimony and 142 exhibits introduced by the parties. With my report I file a typewritten copy of transcript of the testimony, together with the exhibits.

In accordance with the requirements of the order of my appointment and the practice and trial of rate suits in equity, I submitted to the Counsel for all parties on February 26, 1925, a preliminary draft of my report and findings.

On March 5, 1925, I received from counsel written and verbal suggestions and criticisms regarding such preliminary drafts. Thereafter, I completed and now submit and file my report and opinion in its present form which should be deemed to embody my findings and conclusions.

Prior to the taking of testimony and during its progress through their representatives, defendants were afforded by the plaintiff full opportunity to inspect and examine the property, works, accounts and records of the plaintiff and

therefore the defendants were in a position to secure and present to me any matters they deemed of importance on the questions before me. In addition, accompanied by counsel and engineers of the parties, I visited and inspected the manufacturing plant, shops and holder station and territory served by the plaintiff.

[fol. 37] This is a suit to test the constitutionality of Chapter 899 of the Laws of 1923, approved by the Governor June 2, 1923, which inserted in the Public Service Commission Law (Chapter 480 of the Laws of 1910), a new section as follows:

"§67-a. Charge for Gas in Cities of One Million or More.—A gas corporation engaged in the business of manufacturing, furnishing or selling illuminating gas in a city containing a population of one million or over shall not charge or receive for gas furnished or sold in such city a sum per one thousand cubic feet in excess of one dollar, nor furnish in such city gas of a standard less than six hundred and fifty British thermal units per cubic foot, measured under normal conditions of temperature and atmospheric pressure. The Public Service Commission, notwithstanding any other provision of this chapter, shall not allow a rate or charge in the case of such cities in excess of such sum."

Preliminary to the passage of this act, the Legislature did not cause any investigation to be made by a special Legislative Committee or otherwise, or a report concerning the facts to be made by the Public Service Commission, the Legislative agency charged with the duty, among others, to keep informed with respect to utilities under its jurisdiction.

At the time of the enactment of this statute, the plaintiff was charging $1.30 per thousand cubic feet, as a maximum rate, in compliance with an order of the Public Service Commission, made on August 30, 1922, after an investigation and hearings by the Commission, and was supplying gas of a standard fixed by the order of such Commission at 537 British thermal units per cubic foot with a minimum of 525, [fol. 38] and has so continued under the temporary injunction herein granted.

The plaintiff bases its case on the contention that the statute, if enforced, would be confiscatory and deprive it

its property without due process of law, contrary to the Fourteenth Amendment to the Constitution of the United States.

The primary question herein is whether the rate so prescribed will yield the plaintiff a fair return upon the fair and reasonable value of its property employed in the public service. A further question relates to the standard attempted to be fixed by the statute in question.

As to the rate question, there need to be determined, what is a fair return, what is the fair and reasonable value of the property, what are the proper operating expenses and whether such expenses will leave a sufficient margin out of the proposed rate of one dollar per thousand to afford a fair return on the fair and reasonable value of the property used and useful in the public service.

As to the standard, it is to be determined whether it may be considered independent of and as separable from the rate provisions of the statute, and, if so, whether it is reasonable and within the police power of the Legislature to enact, or whether it is an arbitrary enactment not justified on any of the grounds comprehended within the legitimate police powers of the state.

Territory, Plant, and Property of Plaintiff

The plaintiff is a corporation organized under the Transportation Corporations Law of New York and engaged in [fol. 39] manufacturing and selling gas for public and private use in the 30th Ward and a small portion of the 31st Ward in the Borough of Brooklyn. This territory constitutes a substantial portion of Brooklyn and, because of the extension of rapid transit facilities has, since the war, had exceptional residential development which is likely to continue for some years.

Plaintiff's gas works or manufacturing plant is located on a parcel of land fronting on the New York Bay, extending to First Avenue, between 54th and 55th Streets, having a total area of 462,208 square feet, of which 286,454 square feet are used in the conduct of its business. The balance is leased to the Morse Dry Dock & Repair Co., no consideration being asked or given for such leased portion in making any determinations in this suit. At the works or plant site there are seven gas generators of a combined rated

capacity of 17,400,000 cubic feet of gas per twenty-four hours, together with other buildings and equipment incidental to the operation of a gas plant. Its gas holders, shops, yards and booster station are located on four parcels of land at or near Ninth Avenue and 65th Street, having a combined area of 139,843 square feet. Its gas storage holders have a capacity of 2,500,000 cubic feet. It was brought out on the hearing before me that in order to meet the demands upon it and to adequately serve its customers the plaintiff had contracted for and was erecting a new storage holder of 5,000,000 cubic feet capacity, but in making the findings and determinations herein no consideration is given or allowance made for the new holder. This applies likewise to a new office building and to a new booster station in course of construction. On June 1, 1923, plain- [fol. 40] tiff had approximately 205 miles of gas mains laid in the public streets, connected with the premises of its consumers by 26,168 service pipes and had installed on such premises 50,717 gas meters. The evidence shows, and it was admitted before me, that the plant, machinery and equipment of the plaintiff have been well maintained and are in efficient operating condition for the economical production and distribution of gas.

Rate of Return

The development of the plaintiff's territory and the consequent demands for new and additional service have required and will continue to require the Company to raise and invest substantial amounts of new capital in enlargement and extensions of its facilities. The situation peculiarly therefore is one where an adequate return is essential to the company and to the public. Additional capital must be provided to enable the company to meet the demands arising from the growth of population, but this capital will be difficult to raise if the rates charged do not afford a sufficient return to pay the annual charges of present investors and to afford confidence that such charges will continue to be paid. It appears to be settled that a utility is entitled to such rates as will afford a return sufficient to keep and attract capital, giving consideration to the risks of the business and to the return that capital, through open competition, can secure in other channels.

The Supreme Court of the United States has said in Bluefield Water Works and Improvement Company v. Public Service Commission (262 U. S. 679, 692-3):

"A public utility is entitled to such rates as will permit it to earn a return on the value of the property which it [fol. 41] employs for the convenience of the public equal to that generally being made at the same time and in the same general part of the country on investments in other business undertakings which are attended by corresponding risks and uncertainties; but it has no constitutional right to profits such as are realized or anticipated in highly profitable enterprises or speculative ventures. The return should be reasonably sufficient to assure confidence in the financial soundness of the utility and should be adequate, under efficient and economical management, to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties."

While the Supreme Court, in 1909 (Willcox v. Con. Gas Co., 212 U. S. 19, 50), held that the Consolidated Gas Company of New York was entitled to 6% as a fair return, it is generally recognized that, since the World War, the return expected and obtained by capital has materially increased.

As said by the Supreme Court in a more recent case (Lincoln Gas Co. v. Lincoln, 250 U. S. 256, 267-8), after noting that costs of labor and supplies had materially advanced, "annual returns upon capital and enterprise the world over have materially increased, so that what would have been a proper rate of return for capital invested in gas plants and similar public utilities a few years ago furnishes no safe criterion for the present or for the future."

The plaintiff called Edward F. Hayes, who is a member of Blair & Co., bankers, with experience in the sale to investors of securities, incuding utilities, and who handled the [fol. 42] last issue of bonds of the plaintiff. He gave it as his opinion that by comparison with other undertakings in New York City, and the current requirements for capital, it was necessary for the plaintiff to show earnings of at least 8 per cent in order to maintain and support its credit and to enable it to secure new capital in competition with the requirements for capital. He further stated that unless the Company had such earnings as to afford an 8 per cent return, the smallness of the margin over its fixed

charges would adversely affect the confidence of new investors. The bonds sold for the Company by the witness yielded 6½ per cent to the investor. In 1921, and following, the plaintiff sold to investors 8 per cent cumulative preferred stock and in the early part of 1924, it offered and sold 7 per cent cumulative preferred stock. While the defendants called no witnesses on rate of return they introduced tabulations showing offerings in utility securities and transactions in such securities on the New York Stock Exchange in 1924. Consideration of these tabulations indicates that the testimony of Mr. Hayes was sound and I therefore conclude that 8 per cent is a fair and proper return to adopt in this case for the plaintiff.

Ascertainment of Value

This case presents the question of alleged confiscation of property and therefore involves a determination upon the elements or items of that property and the value to be adopted therefor. A company, such as the plaintiff, is entitled to earn a fair return upon the fair value of its property and it is entitled to protection against unjust or unreasonable interference with such right by statute, or ad-[fol. 43] ministrative or other governmental ruling.

In Cotting v. Kansas City Stock Yards Co. (183 U. S. 79), Justice Brewer said:

"As to parties engaged in performing a public service, while the power to regulate has been sustained, negatively the court has held that the legislature may not prescribe rates which, if enforced, would amount to a confiscation of property. But it has not held affirmatively that the legislature may enforce rates which stop only this side of confiscation and leave the property in the hands and under the care of the owners without any remuneration for its use. It has declared that the present value of the property is the basis by which the test of reasonableness is to be determined, although the actual cost is to be considered, and that the value of the services rendered to each individual is also to be considered. It has also ruled that the determination of the legislature is to be presumed to be just, and must be upheld unless it clearly appears to result in enforcing unreasonable and unjust rates." (p. 91.)

In Willcox v. Consolidated Gas Co. (212 U. S. 19), the Court said:

"And we concur with the court below in holding that the value of the property is to be determined as of the time when the inquiry is made regarding the rates. If the property, which legally enters into the consideration of the question of rates, has increased in value since it was acquired, the company is entitled to the benefit of such increase." (p. 52.)

And in Bluefield Co. v. Public Service Commission (262 U. S. at 690), the Court said:

[fol. 44] "Rates which are not sufficient to yield a reasonable return upon the value of the property used at the time it is being used to render the service are unjust, unreasonable and confiscatory, and their enforcement deprives the public utility company of its property in violation of the Fourteenth Amendment."

It appears to be the settled rule that protection will be afforded against a rate that does not afford a fair or reasonable return upon the fair value of property as of the time of the inquiry. This may well mean that a new valuation must be ascertained whenever and as often as a change of rate or other interference is proposed. It might be more satisfactory of prompt determination if value were a matter of fixed accounts, capable of immediate conclusion whenever a rate question involves ascertainment of value. Such a method, however, has not ben recognized and, therefore, under the rulings it is necessary to determine each time the value of the property as of the time when it is alleged that confiscation is threatened.

In the Minnesota Rate cases (230 U. S. 352, at p. 434) the Court has said:

"The basis of calculation is the 'fair value of the property' used for the convenience of the public. * * *

The ascertainment of that value is not controlled by artificial rules. It is not a matter of formulas, but there must be a reasonable judgment having its basis in a proper consideration of all relevant facts. * * *"

The parties herein have presented the facts as to what may be termed the historical or investment cost of the

physical properties, and the plaintiff has presented in de-
[fol. 45] tail the reproduction value of such properties as of June 1, 1923. The defendants have not aided the inquiry by evidence of such reproduction value other than through cross examination of the plaintiff's witnesses. Each side also produced an expert witness as to fluctuations in prices and price levels, and probable future tendencies thereof, to aid in ascertaining the present value of the property that is fair or reasonable as a rate base. In the opinion of both of these experts there is likely to be little recession from the price levels at the time of their testimony, either in respect to labor or materials, and I have accepted this theory in consideration of values herein and of continuation of operating expenses.

The Supreme Court has indicated the elements that should be considered in arriving at a present rate basis, from Smyth v. Ames (169 U. S. 466) to the many cases that have reached that Court within recent years. The tendency has been to give increased consideration to reproduction cost new as a basis for determining fair value. As a fixed rule has not as yet been laid down, I have given consideration to the historical or investment cost of the property, to the reproduction cost new, and I have undertaken to find out a present fair value as well as a finding as to going concern value in order that the Court may have before it these facts upon any determination of the principles that may be urged by the parties. With respect to these values, I have also given consideration to the decree of maintenance, present conditions, the range of price levels as well as the fact that a considerable portion of the property has been installed during the period of high prices.

[fol. 46] Historical Cost of Structures

The defendants contend that the fair value should be based upon the historical costs, exclusive of land which it is conceded should be accepted at its present value. While the cases do not justify any such strict limitation in ascertaining value, nevertheless it is a proper inquiry, in seeking to base a proper judgment, to examine original or historical costs as well as all matters which may aid in striving to arrive at a fair determination.

The plaintiff Company on or about July 1, 1904, merged with and became the successor of the Kings County Gas & Illuminating Co. The books and exhibits show that the total cost to the predecessor company of property existing on July 1, 1904, exclusive of land, was $2,302,997

That between July 1, 1904, and December 31, 1923, net additions to fixed capital amounted to 4,198,604

making $6,501,601

which may be said to be the original or historical cost of the structural property and plant of the plaintiff, so far as the same may be fairly ascertained, exclusive of land and working capital.

Reproduction Cost New of Structures

The plaintiff produced evidence of the reproduction cost new of its property as of June, 1923. It called witnesses who testified at length and submitted exhibits giving full details of their appraisals.

[fol. 47] Buildings.—Henry R. Burt, with a long experience in the construction of buildings in and around New York City, testified that the reproduction cost new of the buildings was $752,134.

Gas Mains and Service Pipes.—John H. Duncan, who for several years has had the contract with the plaintiff for the laying of mains and services, testified with respect to the distribution system, basing his testimony upon his actual experience in the laying of a considerable part of such distribution system. He testified that the reproduction cost new of mains was $2,898,617 and of service pipes, $1,109,686. The size and length of mains and services were testified to by the former Superintendent of Distribution of the Company, who through his long service with the Company was personally familiar with the entire distribution system. Mr. Duncan further estimated that the cost of restoring present street paving over gas mains and services was $1,444,347. A very great part of such paving, however, was laid after the installation of the distribution system, and, while cost of restoring existing paving over mains

might conceivably be at part of reproduction cost new of a distribution system as of a particular date, the plaintiff has asked that there be included in the value of the Company's property only the cost actually incurred by the plaintiff, from time to time, in restoring such paving as had actually been cut in extending the distribution system. The books of the Company showed that, as of June 1, 1923, this amounted to $97,696.65.

Manufacturing Apparatus and Holders.—Colonel Alten S. Miller, called as a witness as to gas equipment and general overheads, is an officer of the Bartlett Hayward Com- [fol. 48] pany, a coporation, extensively engaged in supplying equipment and apparatus needed by gas companies, that has furnished a considerable part of plaintiff's equipment and at the time of hearings was erecting a new gas holder for plaintiff. He testified that the reproduction cost new of machinery and equipment, including gas holders in use, was $1,590,291.

Overheads.—Colonel Miller also testified that there should be allowed, from the point of view of a general contractor, supervising all of the construction work, 13 per cent. on the cost of machinery and apparatus and buildings and appurtenances and 5 per cent. on mains and services for engineering, superintendence and general contractor's expense and profit; that there should be allowed for administrative, legal and miscellaneous general expense during construction, 2½ per cent. on the cost of all property except meters; that interest at the rate of 8 per cent. for one year should be allowed for interest during construction on the cost of all structures except meters and installation of meters and that there should be allowed for taxes during construction $25,646.04, which is one-half of the annual taxes in 1921.

Colonel Miller testified that he had not computed depreciation in his estimate of his reproduction new costs for the reason that the property by reason of adequate current maintenance was as good as new and therefore able to perform fully the functions for which the items of property were intended. He and Mr. Burt submitted lists of minor items of repair that should be made to restore the properties to complete condition, totalling $1,855.50 on buildings and $16,557.92 on machinery, apparatus and equipment.

[fol. 49] He stated that while the property was as good as new an examination at any given date would show similar items of repair that are really matters of routine maintenance. The mains and service pipes have an indefinite life with occasional repairs such as are necessarily being done as current maintenance.

The defendants produced no witnesses upon reproduction costs. It has therefore been necessary for me to rely entirely upon the testimony of the plaintiff's witnesses upon this subject, modified by cross examination. The defendants have objected to Colonel Miller's estimates of overhead allowances. When it is borne in mind that Mr. Burt on buildings, Mr. Duncan on distribution system and Colonel Miller on equipment included percentages for certain overheads, including contractor's profit, it has seemed to me that Colonel Miller's allowances for general overheads are unduly liberal and beyond what would be required. I have therefore used 5 per cent. in the place of his 13 per cent.—2 per cent. instead of 2½ per cent. for administrative, legal and miscellaneous general expenses during construction, 6 per cent. instead of 8 per cent. for interest during construction and taxes in the amount testified to by Colonel Miller.

Meters.—A. J. Gonnoud, Auditor of the plaintiff company, testified from the records of the Company, as to the prices paid for meters. At the prices actually paid in June, 1923, the reproduction cost of meters on consumers' premises June 1, 1923, was $527,071.23, and in stock $24,943.24. Colonel Miller testified that the reproduction cost of installing the meters installed by plaintiff at his own expense, was $264,855.50. The costs so given by Colonel Miller were in [fol. 50] agreement with the actual expense of installations made in 1923. The total for meters and installation of meters is $816,870.

It appears that meters are removed and overhauled regularly in accordance with a schedule and that they are therefore always in a condition as good as new.

Summarizing the foregoing, it would appear that the value of the above property upon a reproduction basis, treated in the manner indicated for the purpose of being considered as part of a proper rate base, may be fairly set down as follows:

Buildings	$750,278
Mains	2,898,617
Services	1,109,686
Gas Apparatus	1,573,733
Engineering, Superintendence, General Contractor's expense and profit	317,536
Interest during construction	421,623
Taxes during construction	25,646
Administrative, legal and miscellaneous general expense during construction	127,014
Meters and installation of meters	816,870
	$8,041,003

Paving over Mains.—As before noted in reviewing Mr. Duncan's testimony in relation to mains and services, he testified in his reproduction estimate that to restore present street paving over mains and service connections would cost $1,444,347. For the reason there pointed out, that most of the distribution system of the plaintiff had been installed in dirt streets before paving, the plaintiff has asked that only the amount actually expended by it in re- [fol. 51] storing paving actually cut be included in a valuation of its property. This seems only fair and proper. The amount is $97,696.65.

Miscellaneous General Equipment.—As additional physical property the Company has laboratory apparatus, office and storeroom furniture and fixtures, stable and garage vehicles and accessories and small tools which have cost the Company, according to its accounts, $102,541.

Additions Subsequent to June 1, 1923.—In addition to properties included above, the plaintiff expended between June 1st and December 31st, 1923, for additions, extensions and improvements $565,414.25 in excess of the cost of property withdrawn from service during that period.

For its general and branch offices, the Company occupies leased premises, but Mr. Bucher, its Vice President, testified that a plot had been acquired for the Company upon which to erect at considerable expense, a modern office building, deemed necessary to accommodate the business and employees of the Company. Although he stated that this building would be started during 1924, I have not in-

cluded any allowance therefor. Other construction work in progress in 1924 was the building of a booster station and the erection of a new 5,000,000 cubic feet gas holder, for which no allowances are included.

Land

The plaintiff produced two witnesses, David Porter and Lewis H. Pounds, as expert witnesses on the value of real estate owned and used by the Company. Both of these wit- [fol. 52] nesses have high standing in the appraisal and handling of real estate in Brooklyn. The defendants called no witnesses on the value of such real estate other than City assessors who testified as to the assessed valuation of such property. The plaintiff's manufacturing plant is located between 1st Avenue and the water front and 54th and 55th Streets, being an important parcel in this stretch of water front of New York Bay which is entirely developed. With the care and consideration obviously given by the plaintiff's two witnesses to the relative valuation of water front properties and their experience and standing, I am convinced that their valuation of this water front property should be accepted. A portion of the property owned by the plaintiff is leased to another concern and is therefore not used in the gas business. The value of such leased portion has accordingly been excluded from present consideration, and I find the value of the portion used by plaintiff in its gas business to be $811,650.

The plaintiff has its holder stations, shops and yards in the center of its district, using the parcels of land comprising the four corners of 65th Street and 9th Avenue. Certain other parcels, not now in use for gas purposes, have not been considered. Messrs. Porter and Pounds testified with respect to the properties used by the Company at 9th Avenue and 65th Street, that gas holders are prejudicial to the value of surrounding land which in turn depresses the assessed valuation of the plaintiff's real estate itself. They stated, therefore, that they had disregarded the existence of gas holders in arriving at a proper valuation of such real estate, just as they disregarded the existence of the gas plant on the water-front property and its special advantages [fol. 53] for gas-making purposes. They therefore based

their estimate on comparison with value of other land similarly situated with relation to transit facilities. On such basis they fixed a total value of $182,352. I am convinced that the assessed valuation does not in any way represent the value of such real estate as it should be consided in this case and that it should be considered as land free of the existing structural property of the Company, just as the water-front property was considered by the witnesses, as water-front property without regard to its peculiar and special value to the plaintiff for gas-making purposes. In the latter case, this Company should not be given a special value for its water-front property nor penalized in the former case for detriment. I have, therefore, accepted the witnesses' valuation in this instance also, making the total value of the land used by plaintiff in its gas business, $994,002.

Working Capital

The Company is entitled to have an adequate working capital to provide, promptly, materials and supplies, current maintenance and repairs chargeable to operating expense and other contingencies so as to permit the Company to carry on its operation as a going concern without delay or extra expense. It must have an adequate cash and credit standing. The proper allowance may be deduced from the actual experience of the Company, supplemented by opinion evidence. Paul Bucher, Treasurer of the plaintiff, testified that the actual average monthly working capital during the year 1923 was $868,372.47 made up of average [fol. 54] monthly working capital as represented in the following accounts:

Accounts receivable	$303,988 60
Material and supplies	219,233 80
Cash	195,142 20
Gas supplied but not billed	125,000 00
General storeroom expense	12,162 40
Coal handling suspense	649 68
Prepaid insurance	5,837 41
Prepaid taxes, etc.	5,358 38
Deposits—public authorities performance of contracts	1,000 00
	$868,372 47

Colonel Miller, for the plaintiff, testified that in his judgment $855,227 should be allowed for working capital.

For the defendants, Mr. Little presented the figure of $446,051 as his estimate of an adequate working capital. Mark Wolff, an accountant witness for the defendants, based his conclusion, that $496,142.04 was the proper allowance, on the difference between the total current assets and total current liabilities for the year 1923, and the defendants have argued that such rule should be the proper test for the ascertainment of working capital. They have also called attention to consumers' deposits, totalling $423,020, and to certain special deposits and reserves with the suggestions that they should be given consideration in determining working capital. Considering the various items of current assets and liabilities and other items to which attention has been called and having regard to the current requirements of the Company, including considerable construction work, I am of opinion that $600,000 should be allowed as working capital.

[fol. 55] Going Value

The plaintiff, in support of its claim to an allowance for going value, examined Colonel Miller, who testified that, based upon his knowledge and experience, there existed a value to the plaintiff, as a going concern, of $1,750,000 over and above the value of the tangible property. He arrived at the value upon a base of approximately $35 per meter in service. Colonel Miller stated, as his definition of such element of value, that it was

"the difference between the value of an operating property with an organized plant and personnel, and serving its customers and having regular dealings with them, and a plant which is merely built and not operating, having no customers, and doing no business."

This question has been before the courts in a number of rate and acquisition cases where the rulings have been such as to require consideration and determination of the plaintiff's claim. The defendants contend that no allowance is to be made thereon. If the claim involved capitalization of early losses merely, it might be disregarded, but the plaintiff claims that between a completed plant merely

ready for business and a completed plant serving the entire community, there has been a cost to the Company that should be allowed, of creating and developing that business and of adjusting and fitting its personnel and properties thereto. In the assumption of a reproduction of an existing and going concern it is presumed that the community exists with all facilities except the one in question and that within a fixed period of time the entire property is created. If it be [fol. 56] a gas property it cannot necessarily be assumed that the residents are anxious and ready to take the service, for they presumably have in service other means for providing the service otherwise to be rendered by gas. They must be persuaded to have their homes piped, to discard coal stoves and furnaces as means of providing heat, all matters of expense to them for which they must be shown that there are superior advantages. Even at the present time the Company maintains a force to persuade residents to use additional appliances and to substitute gas for other means of cooking, hot water supply and heating. I have no doubt that in extending the use of gas for industrial purposes considerable expenses are incurred in salesmanship to industrial managers. There seems no difficulty, therefore, in understanding that there is a value involved in the difference between an inert property and a going property.

In National Waterworks Company v. Kansas City (62 Fed., 853), Mr. Justice Brewer dissects this question in the following language (p. 865):

"It is obvious that the mere cost of purchasing the land, constructing the buildings, putting in the machinery, and laying pipes in the streets—in other words, the cost of reproduction—does not give the value of the property as it is today. A completed system of waterworks, such as the company has, without a single connection between the pipes in the streets and the buildings of the city, would be a property of much less value than that system connected, as it is, with so many buildings, and earning, in consequence thereof, the money which it does earn. The fact that it is a system in operation, not only with a capacity to supply the city, but actually supplying many buildings in the city,—not only with a capacity to earn, but actually earning,—makes it [fol. 57] true that 'the fair and equitable value' is some-

thing in excess of the cost of reproduction. * * * Such a system would be a dead structure, rather than a living and going business. The additional value created by the fact of many connections with buildings, with actual supply and actual earnings, is not represented by the mere cost of making such connections. Such connections are not compulsory, but depend upon the will of the property owners, and are secured only by efforts on the part of the owners of the waterworks, and inducements held out therefor. The city, by this purchase, steps into possession of a waterworks plant,—not merely a completed system for bringing water to the city, and distributing it through pipes placed in the streets, but a system already earning a large income by virtue of having secured connections between the pipes in the streets and a multitude of private buildings. It steps into possession of a property which not only has the ability to earn, but is in fact earning. It should pay therefor not merely the value of a system which might be made to earn, but that of a system which does earn."

The Supreme Court, in Des Moines Gas Co. v. Des Moines (238 U. S. 153, 165), referring to and recognizing this element of value, says:

"That there is an element of value in an assembled and established plant, doing business and earning money, over one not thus advanced, is self-evident. This element of value is a property right, and should be considered in determining the value of the property, upon which the owner has a right to make a fair return when the same is privately owned although dedicated to public use."
[fol. 58] See also Omaha v. Omaha Water Co. (218 U. S. 180); Denver v. Denver Union Water Co. (246 U. S. 178).

Again, in State P. U. Com. v. Springfield Gas & Elec. Co. (291 Ill., 209; 125 N. E. 891, 900), the Court, in affirming a judgment which reversed the Commission which had made no allowance for going value, states the rule of law applicable thereto as follows:

"This element of value is always present in every assembled and established plant doing business and earning money. It is a property right, and must be considered by the commission in determining the value of the property upon which the utility has a right to make a fair return."

In Kings County Lighting Co. v. Willcox (210 N. Y. 479), the Court clearly recognized going value as an item to be appraised and included in a rate base. While certain phases of this decision may be considered to have been disapproved by the United States Supreme Court in Galveston Electric Co. v. Galveston (258 U. S. 388), yet the main principle that going concern value must be valued and allowed, when properly presented and supported, was not disturbed.

See also the recent case of N. Y. Telephone Co. v. Prendergast (300 Fed Rep. 822, 826), where the Court held:

"The denial of any allowance for going value was also error of law. * * * There has been, and probably will continue to be, much difference of opinion as to how to measure this kind of property; but in its nature it is a mere function or attribute of successful co-ordinated effort. A garment is made out of cloth and silk, buttons, and [fol. 59] thread, and by labor; but when completed and well made its value is more than the aggregate cost of the items. It is a going concern, and as such has going value."

A number of cases have been cited to me in which such going value has been determined at figures which were from 10 to 30 per cent. of ascertained value of the physical property.

While it is true that in some cases this element of going concern value is considered with and made a part of the estimates of structural values (Des Moines Gas Co. v. Des Moines, 238 U. S. 153; Galveston Electric Co. v. Galveston, 258 U. S. 388), in the present case it was considered and estimated separately as seems to be the more general practice.

It is obvious that the element of value as here considered cannot readily be proved by direct evidence because of the intangible nature of such element of property. Opinion evidence is therefore of value. Colonel Miller is a man of wide experience, with a knowledge of the development and maintenance of a gas business that qualifies him to present an opinion that is entitled to weight. I have considered carefully his testimony in this respect and, in connection with my conclusion on the value of other elements of property herein, I deem an allowance of $800,000, as reasonable for going value to be considered as a part of the rate base herein.

Fair Value

The plaintiff has urged that the reproduction cost of its structural property should be taken as the fair value in determining whether the proposed rate will give a fair and [fol. 60] reasonable return thereon. In support of this claim the plaintiff presented separately and in detail the structural property and introduced evidence, uncontradicted, of the reproduction cost of such property as hereinbefore referred to. I am convinced, from the standing of the witnesses and the thorough examination and cross examination of them as to details of their appraisals that such appraisals represent, as nearly as could be ascertained, what it would cost to produce a gas property identical with the plaintiff's at prices for labor and materials prevailing in June 1923, if undertaken by a gas company already organized, with a franchise and possessed of adequate capital. There is much force in the plaintiff's contention that such reproduction costs represent actual costs through application of present day index number to costs incurred during the period preceding the high price level. That is, because of the depreciated value of the dollar, the structural reproduction cost represents what it actually did cost the company in the dollar of today to install such property. The aggregate reproduction cost before stated is $8,041,003. The actual or historical costs with present day index number 150 applied only to the cost of the property installed prior to December 31, 1915, are shown below.

Cost to plaintiff's predecessor of property existing June 30, 1904, exclusive of land	$2,302,997 40
Net additions to fixed capital, June 30, 1904, to December 31, 1915	1,316,775 54
	$3,619,772 94
Applying index number 150	5,429,659 41
Net additions to fixed capital, December 31, 1915, to December 31, 1923	2,881,828 15
	8,311,487 56

[fol. 61] While this method cannot be accepted as an infallible rule, nevertheless it is a check on the reasonableness

of the estimated present day reproduction costs. This original cost as thus adjusted by the application of the index number is greater than the reproduction cost as heretofore modified and stated herein. The difference is in part accounted for by the fact that the cost of restoring pavement actually cut in the laying of the mains is included in the original cost figure, while there is no allowance for pavement in the reproduction figure of $8,041,003 found herein.

Giving consideration to the various matters herein discussed, and to the authorities applicable thereto, a few of which I have cited, I have come to the conclusion that the fair value of the plaintiff's property employed in the public service herein is as follows:

Land	994,002
Plant, distribution system and other structural property	8,041,003
Restoring street paving over mains and services cut in laying same	97,696
Miscellaneous general equipment	102,541
Working Capital	600,000
Going Value	800,000
	$10,635,242
Cost of net additions to fixed capital June 1 to December 31, 1923	565,414
Fair value as of December 31, 1923	$11,200,656

This fair value of $11,200,656 is not what it would cost to reproduce as an entirety the plant and property of the plaintiff. In the reproduction of such property there would be the expense of organization and development prior to [fol. 62] construction, which Colonel Miller estimated at $650,000. There would be the cost of financing, which he estimated at the sum of $680,000. There would be interest and taxes on land during construction, besides numerous other items which I have not included. To organize a corporation, secure the necessary capital and construct the plant as the same existed June 1st, 1923, including working capital but exclusive of going concern value, Colonel Miller testified would cost $13,694,371. Adding his independent

estimate of going value, $1,750,000, increases his estimate to $15,444,371. No testimony in contradiction of these estimates was given. While I have given due consideration to Colonel Miller's estimate of reproduction cost of the plant and property as a whole, I have endeavored to ascertain, and the figures found by me attempt to reflect, what it would have cost the plaintiff to build and develop its plant and property as it was built and developed had the same level of prices for materials an labor prevailed throughout the whole period of its construction as prevailed in June, 1923; in other words to measure and state the investment in the property in the dollar of the present.

Counsel for the Attorney-General has urged that there should be taken into account and deducted the amount of the reserve set up by the company in the retirement account known as "Plant Withdrawn from Service." This retirement reserve amounted, at the end of 1923, to $201,910 and had been built up over a period of years by charging to operating expenses a sum equal to 3 cents per thousand cubic feet of gas sold.

Several cases have been cited in support of this conten- [fol. 63] tion, among them the decision of the Michigan Public Utilities Commission in the case of Michigan State Telephone Company (P. U. R. 1923A, page 30), and the decision of the Public Service Commission of the State of New York in the case of the New York Telephone Company (P. U. R. 1923B, 545). I refer particularly to these two cases which have been cited by the defendants' counsel, because the rulings of the Michigan Commission and the New York Commission, on this very point have been reversed by the Federal Courts in cases which were brought following those rulings by these Commissions. The view taken by the New York Public Service Commission upon this point was reviewed by the Special Statutory Court in the Southern District of New York, which is in this Circuit, in New York Telephone Company v. Prendergast, decided July 26, 1924 (300 Fed. 822), where the Court expressly held that the ruling of the Commission deducting the reserve was erroneous, saying (pages 824, 825):

"These accumulated charges are not a separate fund. The total bears no definite relation to the actual condition of the property; for one item may have been and was

charged years ago against the cost of an article scrapped long since, while another was charged yesterday against one just entering upon its life of usefulness. In fact, the depreciation reserve is a piece of bookkeeping, a monthly charge against earnings, to provide means, not only of covering deterioration from use and time, but of minimizing, and only minimizing, future possible losses of any kind, from storm or fire to changes of fashion. The funds or credits thus reserved are, and always have been, expended in strengthening the company's useful property, but what [fol. 64] particular property it is neither possible nor useful to ascertain.

* * * * * * *

To deduct from the fair value of plaintiff's property the entire book reserve for depreciation, in order to reach a rate base, was error of law.

* * * the book charges represent what observation and experience suggested as likely to happen, with some margin over. The legal error is in not recognizing that the law requires deduction only for actual depreciation, just as actual as the present value, and the extent of that depreciation must be ascertained by the same kind of evidence; in the last analysis, opinion based on contemporary investigation."

The following recent cases likewise seem to be authority for holding that the retirement or depreciation reserve, by whatever name designated, being merely a book account, is no evidence of the extent of depreciation and should not be deducted in arriving at fair value; that the entire property must be valued regardless of the amount of such reserve.

People ex rel. Penn. Gas Co. v. Public Service Commission (204 App. Div. 73, 76);

Bronx Gas and Elec. Co. v. Public Service Commission (28 N. Y. State Dept. Rep. 329; P. U. R. 1923A 255; aff'd. without opinion 208 App. Div. 780);

Monroe Gaslight and Fuel Co. v. Michigan Public Utilities Commission (292 Fed. 139);

[fol. 65] Michigan Public Utilities Commission v. Michigan State Telephone Co. (decided October 30th, 1924, 200 N. W. 749; 25 Rate Research 407).

I therefore feel constrained by the weight of authority to hold that it would not be proper for me to deduct from the amount found by me as the fair value of the property of the plaintiff the credit balance in the retirement reserve kept by the plaintiff. In finding the reproduction value of the plaintiff's property, I have, however, deducted the amount which was testified as representing the expenditures necessary to place or restore the physical property of the plaintiff in a condition as good as new. The plaintiff's witnesses testified that there was no depreciation beyond these amounts. No testimony was presented in behalf of the defendants conflicting with the testimony of the plaintiff's witnesses on the question as to the condition of the plaintiff's property and of any actual depreciation existing therein. There is no substantial evidence in the record to the contrary of that testified to by the plaintiff's witnesses.

Ohio Utilities Company v. Public Utilities Commission of Ohio (decided by United States Supreme Court, March 2, 1925, not yet reported), is significant on the question of the weight to be accorded the testimony of experts where there is no contradictory evidence.

Operating Expenses

The plaintiff manufactures carburetted water gas at its water front plant whence it is distributed through its mains [fol. 66] and distribution system to its consumers throughout the district served. The plaintiff keeps and maintains very complete and detailed books and records showing its operations and dealings. Both before and during the trial these were accessible to the defendants and their accountants did, in fact, inspect and study them. In the course of the examination of witnesses many of the books and records were produced before me, and as required, or requested, original records were produced throughout the hearings. The plaintiff presented detailed evidence in respect to its operating expense during the year 1923, including the methods of handling the material necessary to the making of gas and the charging of all items of expense in accordance with the Uniform System of Accounts prescribed by the Public Service Commission. During the year 1923, the plaintiff manufactured 1,977,410,000 cu. ft. of gas and its sales were

1,794,969,872 cu. ft. The total cost thereof, including expenses incident to the sale of gas appliances, in manufacturing and distributing gas was $1,640,279.49 or 91.38 cents per thousand cu. ft. of gas sold, made up as follows:

		Cts. per M
Production expenses	$892,501 13	49 73
Distribution expenses	143,636 40	8 00
Street lighting expenses	915 94	05
Commercial expenses	124,461 36	6 93
Promotion expenses	49,423 58	2 75
General expenses	156,651 13	8 72
Retirement expense	53,990 21	3 00
Federal income tax	68,303 61	3 81
Other taxes	140,987 02	7 86
Uncollectible bills	9,409 11	53
Total operating expenses	$1,640,279 49	91 38

[fol. 67] The defendants have not questioned the fairness or reasonableness of such operating costs. In fact, Mr. Little, the only witness called in the matter of operating expenses commended the excellent condition of the property and the efficiency of its personnel and operation. They did, however, call attention to two items. One of these relates to the charging and crediting of the cost of tar boiler fuel. In the use of oil in the making of gas there is a certain amount of tar recovered as a residual which may be sold or made use of by the company as boiler fuel in place of purchased boiler fuel. As it is recovered, it is the practice of the company, which has continued for some years, to credit such recovered tar at the price per gallon paid for the oil in use at the time of recovery. When it is used as boiler fuel, it is charged at the price at which it was credited when it went into storage. During the year 1922, there was a considerable quantity of tar recovered, a portion of which was not used until the calendar year of 1923. The oil price under the 1923 contract for oil was a little less than that for 1922, and the defendants contend therefore that tar should be charged at the price of oil at the time when the tar is used. In accordance with this contention, there would therefore be a slight reduction of operating expenses during 1923. I am unable to see the force of this contention.

The Company is following a practice extending over a period of years under which the tar is credited at the oil price current at the time of recovery and charged at the same price when used. This may result in the charge price being higher or lower than the oil price on a given date, depending upon whether the tar in storage was recovered at a time when the price of oil was higher or lower. In the long [fol. 68] run it does not make any difference whatever for it means that all of the oil, including the tar residual, is used up in the making of gas, and under its practice is charged at the cost price. Furthermore, the Company showed that at the price charged for such tar used as boiler fuel, the cost was less than would have been the equivalent of coal boiler fuel which the Company would need to have purchased had the tar not been available as fuel.

Although bearing only slightly on this point, the defendants have commented on the low percentage of tar recovery during 1923 and urged that it should have been higher. I am unable to see the force of this. Gas engineers in the making of gas do not strive to produce a recovery of tar. On the contrary, the more efficient the process of gas manufacture is, the more complete is the breaking up of the oil and the less there is of residual. Any comparison with a higher percentage of tar recovery by other companies is apparently a comparison in relative efficiency of manufacture.

The other point of criticism by the defendants is the charge of three cents per thousand cubic feet to an account known as Plant Withdrawn from Service, a retirement account, and so designated in the above table.

Mr. Little, for the defendants, testified that he had made an examination of the accounts of the plaintiff covering a period of years for the purpose of ascertaining the actual amount of retirements charged to this account which, on the average, amounted to a little less than one cent per thousand. The amount credited to this account at the end of 1923 was $201,910.62, which is the net aggregate resulting [fol. 69] from the charge of three cents per thousand over a period of years. Mr. Little recognized the need of making a charge to operating expenses to take care of plant withdrawn from service but contended that the result of his examination of the account indicated that a charge of three

cents was in excess of the actual experience of the Company and was not needed. I am inclined to agree with him on this point on the evidence presented before me and, therefore, conclude that, for the purposes of determining the questions involved in this case, such charge should be taken at one and one-half cents.

The gas furnished and sold by the plaintiff during the year 1923 showed a monthly average of heat content slightly above the standard of 537 monthly average prescribed by the Public Service Commission. This appears to be good practice, for, because of fluctuating temperature and other conditions, it is necessary to manufacture gas of a heat content above the prescribed standard to insure the furnishing to consumers of gas in compliance with the standard. In the manufacture of this gas, the plaintiff used 2.83 gallons of gas oil, 33.98 pounds of generator fuel and 5.24 pounds of solid boiler fuel per thousand cubic feet of gas made. In order to produce a gas of a higher heat content, it is necessary to use an additional quantity of gas oil which results in a reduction in generator and boiler fuel and an increase in the amount of tar recovered. In considering the quantities of material necessary to produce a standard of 650 British thermal units, it is necessary to rely upon opinion evidence for the reason that the witnesses were unable to cite, within their own experience and knowledge, any situation where a gas company had undertaken, for [fol. 70] a considerable period of time, the manufacture of gas with such a high heat content. It seems safe, however, from the testimony before me, to assume that to furnish gas at 650 British thermal units would require not less than 4.65 gals. of gas oil, 32 pounds of generator fuel and 3.98 pounds of solid boiler fuel per thousand cubic feet of gas made, with a tar recovery of approximately 16 per cent of the amount of gas oil used. Applying the cost figures of 1923 to these items, indicates that, to make gas of a standard of 650 British thermal units would increase plaintiff's costs 5.44 cents per thousand cubic feet.

As itemized and shown in the Findings accompanying this opinion, the operating costs, exclusive of Federal income tax and by reducing the retirement expense from 3 to 1½ cents, become 86.08 cents per thousand cubic feet of gas sold in 1923, at the 537 British thermal unit standard, and

adding the 5.44 cents as the additional cost of making 650 British thermal unit gas, gives 91.52 cents per thousand as the cost had the plaintiff undertaken to furnish gas of the higher standard.

Operating Expenses for 1924. On the hearing of the objections to my tentative report, plaintiff, at the request of one of the defendants, furnished for the record the amount of its sales of gas in the twelve months ended December 31st, 1924. Such sales were 1,947,207,840 cubic feet, an increase of 152,237,968 cubic feet over the sales of the previous year. The chief items in the expense of producing gas are the costs of materials used, labor and taxes. The assessed valuation of real estate and improvements is fixed so that taxes therefore can be ascertain. The cost of labor is unlikely to change. The materials used in the making [fol. 71] of gas are gas oil and coke for which the Company makes contracts. As the Company has now reached the point of large production volume, it appears that any increase in sales will not reduce the unit cost of making and furnishing gas. Consequently any changes in the operating expense per unit are limited to those caused by differences in the cost of materials. The Company was able to secure contracts for its supply of gas oil and generator fuel for 1924 at slightly lower prices than it had in 1923. Applying these reductions to the unit cost of 1923 shows a reduction of approximately 1.58 cents per thousand. So that if the plaintiff had operated in 1923 under the oil and coke contracts made for 1924, the total operating costs would have been 84.50 cents per thousand of gas sold which may be taken as the total of operating expenses for 1924 to be considered herein, with a corresponding reduction in the assumed operating expenses for the making of gas of a standard of 650 British thermal units. Each of the expert witnesses produced by the parties on price levels agreed, furthermore, that there were no indications of lowering prices for a considerable period.

Mr. Little undertook to make a forecast of probable operating expenses for the year 1924 by setting forth the exact amount of money required for each of the sixty accounts included in operating expenses although he presented no criticism of operating expenses of 1923 other than as above indicated. It would appear, from the nature of

the gas business and the method of keeping accounts, that it may be difficult to assign a particular sum of money for each item of expense for the year but that the total cost per thousand for each item of expense may be forecast from [fol. 72] the experience of the Company and the price paid for labor and materials. I have therefore taken the above figure of 84.50 cents per thousand cubic feet of gas sold as the proper cost of gas for the year 1924 at the 537 British thermal unit standard actually furnished, and 89.94 cents per thousand as the cost during that year had the plaintiff undertaken to furnish a 650 British thermal unit gas.

In the operating expenses, but not segregated in the books of the Company, are included expenses for conducting the business of selling gas appliances. It is the practice of this and other gas companies to conduct such business, partly to aid consumers in securing gas appliances manufactured under standard specifications that will thus render most efficient service to the consumers, and partly, by thus promoting the sale of appliances to be used for additional purposes, to increase the sale of gas. A company, in order to secure these advantages, may sell such appliances either at actual cost or at a slight advance, crediting to revenue the amount realized therefrom. During 1923, the plaintiff derived therefrom and from other sources, a revenue of 4.57 cents per thousand. In all calculations made herein, as specifically shown in the Findings, this item has been added as an operating revenue and computed accordingly.

Return to the Company

For the year 1923, with the above operating expenses of 86.08 cents per thousand cubic feet of gas sold at the prescribed rate of $1.00 per thousand, plus the miscellaneous operating revenue of 4.57 cents per thousand, making a total [fol. 73] revenue of 104.57 cents per thousand, there would be left 18.49 cents per thousand as a return to the Company. Applying this to the 1,794,969,870 cubic feet of gas sold gives $331,876.82. Federal income tax in the sum of $2,848.81 would be payable, leaving $329,028.01 available for return on property.

Had the Company undertaken to furnish gas of 650 British thermal units, the corresponding net return to the Com-

pany would have been 13.05 cents per thousand or a total of $234,230.26, with no income tax payable.

For the year 1924, with the operating expenses 84.50 cents per thousand cu. ft. of gas sold at the prescribed rate of $1.00, plus the miscellaneous operating revenue, there would be left 19.71 cents per thousand as a return to the Company. Applying this to its sale of 1,947,207,840 cubic feet in 1924, gives $383,775.53. Federal income tax in the sum of $9,336.15 would be payable, leaving for return on property $374,439.38.

Had the Company undertaken to furnish gas of 650 British thermal units in 1924 the net return to the Company would have been 14.27 cents per thousand or a total of $277,847.39, with no income tax payable.

Thus, the return of $329,028 in 1923 for gas of the standard actually furnished, 537 British thermal units, would be an 8 per cent return on only a value of a little over $4,000,000, or a 6 per cent return on approximately $5,500,000.

The Public Service Commission defendant herein admitted in its answer a value of approximately $7,500,000 and the Attorney-General has urged a finding of present [fol. 74] cost of not to exceed $7,500,000. On any basis, therefore, of value or rate of return, the return for 1923 does not constitute the fair return to which the Company is entitled. On the basis of the fair value of $11,200,656 as found by me the above return is only 2.94 per cent thereof.

Had the Company furnished gas of 650 British thermal units during 1923, the return of $234,230 is 8 per cent on less than $3,000,000, 6 per cent on less than $4,000,000, and only 2.09 per cent on the fair value of $11,200,656. Consequently the proposed rate of one dollar per thousand cubic feet must be deemed confiscatory as to 1923.

For 1924, a return of $374,439.38, would have been 8 per cent upon a value of a little over $4,600,000, a 6 per cent return on less than $6,150,000 and 3.34 per cent on the fair value as herein found, without consideration of fixed capital installed during 1924 in addition to the fair value as of December 31, 1923.

Had the Company been furnishing gas of 650 British thermal units during 1924, the return of $277,847.39 would

have been an 8 per cent return on only $3,400,000, a 6 per cent return on only $4,600,000, and 2.48 per cent on the fair value found as of December 31, 1923. The statute must therefore be deemed to impose a rate that is confiscatory as to 1924.

Gas Standard

The statute in question, besides fixing a rate of $1.00 provided as to such gas companies,

* * * "nor furnish in such city gas of a standard less [fol. 75] than six hundred and fifty British thermal units per cubic foot, measured under normal conditions of temperature and atmospheric pressure."

Questions are herein raised whether this provision is constitutional and whether it is separable from the rate provision. It is obvious that in giving consideration to a rate for gas there must be a particular standard of quality for which such rate is to be charged.

In granting powers to the Public Service Commission, the Legislature, initially and by amendment, has provided:

* * * "the commission may, by order, fix just and reasonable prices, rates and charges for gas * * * notwithstanding that a higher or lower price has been theretofore prescribed by general or special statute, contract, * * *." (Sec. 72, P. S. C. Law) and

"Have power by order to fix and change from time to time standards of the purity, illuminating power and heating power, and standards for measurement thereof, of gas * * * notwithstanding that other standards * * * may have been fixed by general or special statute. * * *" (Sec. 66—Subdiv. 3).

The witnesses before me were unanimously of opinion that present day use of gas requires a standard based upon heat content. In earlier days, when gas was used for lighting, chiefly with open flame burners, a candle-power standard or measure of light content, was the proper standard. A candle-power standard prescribed by the Legislature was in effect throughout New York City until the Public Service Commission, by its orders of August 30, 1922, prescribed

[fol. 76] a heat standard and fixed such standard at a monthly average of 537 British thermal units per cubic foot with a minimum of 525. The statutory powers of the Commission and its orders as to such a standard remain in effect except as they may be limited by the statute herein in question. This statute undertook to fix a rate of $1.00 for gas of not less than 650 British thermal units. I have already found that the $1.00 rate would be confiscatory based upon the furnishing of gas of a monthly average of 537 British thermal units as prescribed by the Commission's order and that the $1.00 rate would be confiscatory for gas furnished of a standard of 650 British thermal units as proposed by the statute. Two questions remain—whether the provisions as to the rate and the standard are separable and whether compliance with the 650 British thermal unit provision is reasonable and practicable.

Upon the question whether provisions for a rate and standard in the statute are intended to be regarded as inseparable, it may be pointed out that the Legislature of New York has never, except when fixing a rate, fixed standard for gas and it is not likely that it would have passed a statute containing only a provision as to a standard. It would appear that the Legislature intended to fix a rate for a certain standard, particularly when we consider that the provision as to a standard was inserted in the bill after its introduction. Had the Legislature intended to fix a rate for gas of a standard, already fixed or to be fixed by the Commission, the amendment would not have been inserted. The rate and standard therefore were intended to be so tied together as to be inseparable and that if one fell the statute failed.

[fol. 77] Considered independent of the rate limited by the statute, the standard fixed is void as an unreasonable, arbitrary and destructive enactment not warranted by the police power of the state. Four witnesses of extended experience in the gas business testified that it was not only altogether impossible for plaintiff to furnish its consumers anything like satisfactory service under the 650 British thermal unit standard, but that the furnishing of gas of such standard would be attended with hazards to life and property. They were Mr. Robert M. Searle, the president of the Rochester Gas and Electric Corporation, a consult-

ing engineer of 39 years' experience in the gas business, including researches on the best method of making a useful high heat content gas; Mr. John F. Wing, engineer of research of the Boston Consolidated Gas Company, with American and European training in chemistry, and with 36 years' experience in the manufacture and distribution of gas; Mr. A. Gordon King, service engineer of the American Gas Association, a trade association representing 90 per cent. of the gas manufactured in America, a graduate of the City and Guilds of London Institute in gas manufacture and allied subjects, formerly gas engineer for the New York Public Service Commission for the Second District, and later gas engineer for the Commonwealth of Pennsylvania, who for over 20 years has made tests and investigations as to the utilization efficiencies of gases in the respect to various degrees of heat content; and Mr. A. S. B. Little, formerly gas engineer of the Illinois Utilities Commission, a witness for the defendant, Attorney-General.

According to the witnesses, gas of as high heat content as 650 British thermal units has never been prescribed or [fol. 78] supplied anywhere for general industrial and domestic uses. All witnesses agreed that efficient or satisfactory service is obtainable only by the furnishing of gas of a substantially uniform heat content. Gas is used in appliances that generally utilize the Bunsen burner, which Mr. Searle said was so devised as to consume the largest possible quantity of gas in the smallest possible flame area. It is essential that there be a suitable and proper pre-mixture of gas and air which is admitted through a shutter into a chamber through which the gas passes to the tip of the burner. The quantity of air that should be admitted is dependent upon the heat content of the gas. It is obvious that as the heat content of the gas varies the mixture will not be balanced. When the heat content of the gas is increased without adjustment in the air shutter, a long yellow flame is produced, due to the insufficiency of air in the mixture, and the utensil to which the flame is applied is covered with a deposit of carbon. On the other hand, if the heat content of the gas is reduced, there is an over supply of air, causing reduction in the flame area and often times a flare back in the air chamber, sometimes causing an explosion.

If it is impossible to supply 650 British thermal units gas uniformly, there cannot be satisfactory or efficient service. Gas of 650 British thermal units cannot be manufactured at the works with the same degree of uniformity of heat content as gas of a lower heat content. An increase in heat content is effected through the use of additional gas oil. It appears that to make gas of 537 British thermal units, for instance, requires approximately 2.83 gallons of gas oil per thousand cubic feet of gas made, while to make [fol. 79] gas of 650 British thermal units would require at least 4.65 gallons of gas oil. Mr. Little testified that it would require at least 2 gallons more to make the higher heat content gas. In the use of such large quantity of gas oil the witnesses say that it is impossible to make gas as stable or as uniform as when the smaller quantity of oil is used. When it is attempted to distribute and supply high heat content gas extreme and undesirable variations are met due to the effect of varying temperature affecting gas in the holders and in the distribution system. The additional gas oil used produces in the gas a larger quantity of condensible hydrocarbons which drop out of the gas as the temperature falls, causing the heat content to be lowered and then when the temperature rises these are picked up and increase the heat content. These variations in heat content not only produce an unsatisfactory service but create hazards. Gas of 537 British thermal units may vary 5 per cent., or about 25 units, from the standard on delivery to consumer, which is stated to be the limit of utilization of appliances without readjustment. 650 British thermal unit gas might vary 100 British thermal units either way from the standard.

Since October, 1922, plaintiff has furnished gas in compliance with the order of the Commission, of August 30, 1922, prescribing an average of 537, and a minimum of 525, British thermal units per cubic foot. The appliances of plaintiff's consumers are adjusted or suited to utilize such gas and consist mainly of gas ranges and water and room heaters. While the larger part of the appliances have adjustable burners, they are not so simple or easy to adjust that it can be done by consumers themselves. The adjust- [fol. 80] ment of burners is distinctly a function of men trained to that work. All of the witnesses are in agreement

that it is entirely impracticable and impossible for plaintiff to furnish 650 British thermal unit gas unless and until the appliances are adjusted or adapted for such gas. Twenty-one per cent. of the appliances are not adjustable and would have to be discarded. Any attempt to adapt the adjustable appliances to gas of 650 British thermal units would require at least six months' time, for there would need to be, first, an adjustment to approximate 600 British thermal units and a raising of the gas manufactured to that point, and then an adjustment for the 650, with gas of that standard thereafter manufactured. The work would have to be done in two stages because it is impossible to change at once from a 537 gas to a 650 gas because of the great difference between these standards. The need of a considerable period of time in which thus to adjust appliances and to make other changes is well known to Commissions and others familiar with the gas business. The Legislature, however, provided that its statute, proposing that the standard should be changed from the existing standard fixed by the Commission at 537 British thermal units to 650 British thermal units, should take effect immediately. The companies were thus apparently expected to comply forthwith in disregard of physical facts, or suffer the penalties of violation of a provision of law. The temporary injunction herein, however, permitted the plaintiff to continue under the standard fixed by the Commission pending the outcome of this suit.

Regardless, however, of immediate compliance, it is to be observed that such a substantial raising of the heat con- [fol. 81] tent would require adjustment of appliances. Many appliances could not be adjusted and would need to be scrapped. Furthermore, the plaintiff contends that no duty is imposed upon it, or legal right given to it, to enter the premises of consumers to adjust appliances, or to compel the discarding of non-adjustable appliances, nor is there any legal obligation requiring consumers to adjust their own appliances, or to have appliances that will utilize efficiently gas of a prescribed standard. A mere notice from the Company to consumers to adjust or obtain appliances suitable to gas to be furnished would be ineffective. Yet if all appliances were not proper in adjustment danger would follow from an attempt by the Company to furnish

gas that would not be properly utilized. The Legislature has not provided a procedure that will permit assurance of properly adjusted appliances. Without such assurance, compliance with the proposed standard would be dangerous to life and property, a responsibility that the Legislature could hardly have intended. Incidently, gas of such a standard, as has been indicated above, would result in unsatisfactory and inefficient service because of wide variations in quality, even if all appliances were set for 650 British thermal units.

Such a regulation would seem to be beyond the proper police power of the State. Analogous is the holding of the Supreme Court in Willcox v. Consolidated Gas Co. (212 U. S. 19, 53) as to a regulation as to pressure, where it is said:

"The evidence shows that to put a pressure such as is demanded by the acts upon the mains and other service pipes in their present condition would be to run a great risk of explosion, and consequent disaster. Before com- [fol. 82] pliance with this provision would be safe the mains and other pipes would have to be strengthened throughout their whole extent, and at an expenditure of many millions of dollars, from which no return could be obtained at the rates provided in the acts. This would take from the complainant the ability to secure the return to which it is entitled upon its property, used for supplying gas, and the provision as to the amount of pressure is therefore void."

And also South Covington Railway v. Covington (235 U. S. 537) where the Court said:

"As to the regulation affecting the temperature of the cars, and providing that they shall never be permitted to be below 50° Fahrenheit, the undisputed testimony shows that it is impossible in the operation of the cars to keep them uniformly up to this temperature, owing to the opening and closing of doors, and other interferences that make it impracticable. We therefore think, upon this showing, this feature of the ordinance is unreasonable and cannot be sustained" (pp. 548-9).

Burns Baking Co. v. Bryan (264 U. S. 504) is one of the latest expressions of the United States Supreme Court on

this subject, holding certain restrictions on the weight of bread to be unreasonable and arbitrary and repugnant to the Fourteenth Amendment. The Court there said:

"As indicated by the opinion of the State Supreme Court, ingredients selected to lessen evaporation after baking would make an inferior and unsalable bread. It would be unreasonable to compel the making of such a product or to prevent the making of good bread in order to comply with the provisions of the act fixing maximum weights. [fol. 83] The act is not a sanitary measure" (pp. 515, 6).

These and other rulings of the courts hold that a police regulation cannot be arbitrary but must be just and reasonable and within the requirement that it shall properly protect the lives, health, morals or welfare of a community. The plaintiff, in harmony with efforts of the industry, has attempted to furnish gas of a quality best suited to present day needs of its public and in accordance with the findings of the Public Service Commission which, as an expert agency of the State, has kept itself informed upon such matters. The action of the Legislature in thus attempting to make effective an arbitrary standard, condemned by expert witnesses on both sides, and productive of danger, with no compensating advantages, has, in my opinion, gone beyond its power and its enactment should be held unconstitutional and void.

Conclusion

The views herein expressed and the conclusions reached indicate so clearly that the proposed rate is confiscatory, as well as the proposed standard arbitrary and beyond the police power to enact, that there would seem no room for argument that the Company should have experimented under the new rate and presumably with the new standard. I am unable to find any case that would require a trial period of the statute before questioning its validity with the facts so clear as to actual operating expenses and results so serious from an attempt to change to the proposed standard. [fols. 84 & 85] I have made formal Findings of Fact and Conclusions of Law which are attached and submitted herewith. A correct transcript of the testimony and copies of the exhibits together with a stipulation of the various solic-

itors waiving the signatures of the witnesses to their several depositions, and further waiving the filing of the original exhibits marked in evidence, are also filed herewith.

Respectfully submitted.

Almeth W. Hoff, Special Master.

Brooklyn, N. Y., April 15, 1925.

[fol. 86] In United States District Court

[Title omitted]

Report of the Special Master—Filed April 20, 1925

To the Honorable Judges of the United States District Court for the Eastern District of New York:

I, the undersigned, the Special Master appointed by the Honorable Marcus B. Campbell, District Judge, by an order entered herein October 11, 1923, directing me to take the testimony and evidence upon the issues herein, make all needed computations and fully hear the facts and report findings of fact and conclusions of law, together with the evidence for the advisement of the Court,

[fol. 87] Do hereby Respectfully Report that, having been attended by counsel for the respective parties as below stated, I proceeded to take the proofs submitted by the parties and, after hearing the parties fully, do make the following Report.

Appearances:

Samuel F. Moran (Samuel F. Moran, John D. Monroe, Travis H. Whitney and Robert H. Grimes, of Counsel), Solicitor for Plaintiff.

Charles G. Blakeslee (Sherman C. Ward, of Counsel,) Solicitor for Defendants William A. Prendergast, William R. Pooley, Charles Van Voorhis, George R. Lunn, and George R. Van Namee, constituting the Public Service Commission of the State of New York.

James A. Donnelly (Judson Hyatt, of Counsel), Solicitor for Carl Sherman, as Attorney-General of the State of New York.

John Holley Clark, Jr. (Anthony P. Ludden, of Counsel), Solicitor for Albert Ottinger, substituted for Carl Sherman, as Attorney General of the State of New York.

Upon the proofs as taken I find and report as follows:

Findings of Fact

1. Plaintiff was duly incorporated on the 26th day of May, 1904, under the Transportation Corporations Law of the State of New York, and since July 1, 1904, has been and still is engaged in the business of manufacturing, furnishing and selling gas for public and private use in the territory comprising the thirtieth ward and a small part of [fol. 88] the thirty-first ward of the Borough of Brooklyn in the City of New York, which is a city containing a population of one million or more.

2. The Kings County Gas and Illuminating Company was incorporated December 17, 1889, under chapter 40 of the laws of 1848, and the several acts amendatory thereof and supplementary thereto, and on or about December 26, 1889, received the consent of the municipal authorities of the town of New Utrecht, Kings County, to lay conductors for conducting gas through the streets, lanes, alleys and squares in said town. Said Kings County Gas and Illuminating Company commenced supplying gas for public and private use on or about September 1, 1891, and continued to supply the same until its merger with the plaintiff July 1, 1904. Pursuant to the provisions of chapter 451, laws of 1894, the territory comprising the town of New Utrecht on July 1, 1894, was added to the City of Brooklyn as the thirtieth ward thereof, and since January 1, 1898, has been, and now is, the thirtieth ward of the Borough of Brooklyn, City of New York.

3. On July 1, 1904, plaintiff, being then the owner of all the issued and outstanding capital stock thereof, duly merged into and with itself said Kings County Gas and Illuminating Company in accordance with the provisions of the Stock Corporation Law of the State of New York, and thereupon acquired and became, and since has been, possessed of all its estate, property, rights, privileges and franchises.

4. Plaintiff has issued and outstanding in the hands of the public $750,000 of 5 per cent. first mortgage bonds, due October 1, 1940, and $2,389,000 of 5 per cent. and $1,822,000 [fol. 89] of 6½ per cent. first refunding mortgage bonds, due October 1, 1954. Plaintiff has issued and outstanding 50,000 shares of common capital stock of no par value and $500,000, par value of 8 per cent. cumulative preferred stock. Since January 1, 1824, plaintiff has obtained subscriptions in the amount of $702,400 to an issue of 7 per cent. cumulative preferred stock, two-thirds of which subscriptions were from its customers and employees. At May 8, 1924, such subscriptions to the amount of $429,900 had been paid in full and $95,169.50 had been received on account of the balance of the subscriptions.

5. The credit balance in the contingency reserve on plaintiff's books at December 31, 1922, was $256,695.72, and at December 31, 1923, it was $292,689.21; its bond amortization reserve at December 31, 1923, had a credit balance of $38,189.09, its uncollectible bill reserve a credit balance of $5,000, and its retirement reserve a credit balance of $201,910.62.

6. Plaintiff owns a piece or parcel of land bounded on the east by First Avenue, on the north by the south line of 54th Street, and the center line of 54th Street extended, on the west by New York Bay, and on the south by the center line of 55th Street extended, in the Borough of Brooklyn, having a total area of 462,208 square feet, 295,855 square feet being uplands and 166,353 square feet being lands under water outside the bulkhead line, the present fair market value of which land without improvements is $1,141,-344. Plaintiff's gas works or manufacturing plant is located upon the lands above described and 231,381 square feet of the upland and 55,073 square feet of the lands under [fol. 90] water are used by the plaintiff in the conduct of its business, the present fair market value of which land without said improvements is $811,650.

7. Plaintiff owns four parcels of land at 9th Avenue and 65th Street on which are located its gas holders, shops and yards. The parcel at the northwest corner of 9th Avenue and 65th Street has an area of 18,000 square feet, the

present fair market value of which parcel without improvements is $23,750. The parcel at the northeast corner of 9th Avenue and 65th Street has an area of 4,001 square feet, the present fair market value of which parcel without improvements is $6,300. The parcel at the southwest corner of 9th Avenue and 65th Street has an area of 109,017 square feet, the present fair market value of which parcel without improvements is $138,771. The parcel at the southeast corner of 9th Avenue and 65th Street has an area of 8,825 square feet, the present fair market value of which parcel without improvements is $13,531.

8. Plaintiff's manufacturing works are equipped with seven gas generators of a combined rated capacity of 17,400,000 cubic feet of gas per twenty-four hours. Its gas storage holders have a capacity of 2,500,000 cubic feet. Plaintiff, on June 1, 1923, had approximately 205 miles of gas mains laid in the streets, avenues and public places of said thirtieth and thirty-first wards, consisting of 1,076,410 feet of cast iron mains, ranging in sizes from 3 inches to 20 inches, 6,361 feet of wrought iron mains, ranging in sizes from 1 inch to 3 inches, and 814 feet of wrought steel mains, ranging in sizes from 4 inches to 18 inches. On June 1, 1923, plaintiff's said gas mains were connected to the prem- [fol. 91] ises of its consumers by 26,168 service pipes of a combined length of 1,217,866 feet, and on that date plaintiff had installed on the premises of said consumers 50,717 gas meters.

9. The cost of reproducing the manufacturing plant, distributing system and all other structural property owned and used by the plaintiff in its gas business as of June 1, 1923, at prices for labor and material then prevailing, exclusive of the cost of restoring street pavement over gas mains and gas service pipes, was, and is, at least the sum of $8,059,417, classified as follows:

Buildings	$752,134
Manufacturing apparatus and equipment and gas holders	1,590,291
Gas mains in streets	2,898,617
Gas service pipes	1,109,686
Gas meters on customers' premises and in stock	816,870

Engineering, superintendence and general contractor's expense and profit	317,536
Interest during construction	421,623
Taxes during construction	25,646
Administration, legal and miscellaneous general expenses during construction	127,014
	$8,059,417

10. The plant, machinery and equipment of the plaintiff have been well maintained repairs, renewals and replacements having been made as required. Said plant, machinery and equipment are in as efficient operating condition for the economical production of gas as if new. The uncontradicted evidence shows that an expenditure of $1,855.50 on the buildings and $16,557.92 on the machinery, apparatus and equipment, as of June 1, 1923, would put the same in a condition substantially as good as they were when new. These amounts deducted from the reproduction cost of the structural property give a reporduction value of $8,041,003.

[fol. 92] 11. The cost to restore the street pavement then existing over the gas mains and gas service pipes of plaintiff as of June 1, 1923, at prices for labor and material then prevailing was and is, at least the sum of $1,639,333 made up as follows:

Contract price	$1,444,347
Engineering, superintendence and miscellaneous expenses	108,326
Interest during construction	86,660
	$1,639,333

12. To June 1, 1923, plaintiff had expended the sum of $97,696.65 in the restoration of street pavement necessarily cut in the laying of gas mains and gas service pipes in the extension from time to time of its distribution system.

13. As of June 1, 1923, plaintiff owned and used in its gas business miscellaneous general equipment, consisting of laboratory apparatus, office and storeroom furniture and fixtures, stable and garage vehicles and accessories and small tools, which had cost the sum of $102,541.

14. Between June 1 and December 31, 1923, plaintiff expended for additions, extensions and improvements to its manufacturing plant and distributing system the sum of $565,414.25 in excess of the cost of all property withdrawn from service during said period.

15. The territory served by plaintiff is a rapidly growing section of New York City, and to meet the increase in demand for gas plaintiff has been obliged to enlarge its manufacturing facilities, extend its mains, and install additional new gas service pipes and meters each year. Plaintiff installed at new locations 4,029 meters in 1921, 5,665 meters in 1922, 7,086 meters in 1923, and 2,744 meters in the first four months of 1924, having on the premises of its con- [fol. 93] sumers at April 30, 1924, a total of 58,653 meters. The estimated expenditures of plaintiff for main extensions, services and meters from January 1 to December 31, 1924, were $521,786.18.

16. Due to the increased and increasing demand upon plaintiff's plant and facilities, it is necessary for plaintiff to enlarge its gas storage capacity, and plaintiff has entered into a contract for the construction of a 5,000,000 cubic foot gas holder on its lands at 9th Avenue and 65th Street, costing approximately $450,000.

17. In 1923 plaintiff entered into a contract for, and commenced, the construction on its lands at 9th Avenue and 65th Street of a booster station necessary adequately to distribute under suitable pressure the constantly increasing supply of gas to outlying districts within its territory. Expenditures estimated to amount to $148,674.96 were required to be made in 1924 to complete the work under said contract.

18. Plaintiff has never owned an office building, but has rented office space for its officers and clerical force. Due to the growth of its business and the consequent increase in its office requirements, the quarters occupied by plaintiff for several years past have become entirely inadequate. Plaintiff has acquired a site on which to construct an adequate office bulding, the estimated cost of which is $550,000.

19. The average monthly working capital employed by the plaintiff in the year ended December 31, 1923, was

$868,372.47, made up of the average monthly capital in the following accounts:

[fol. 94] Account receivable	$303,988 60
Material and supplies	219,233 80
Cash	195,142 20
Gas supplied but not billed	125,000 00
General store room suspense	12,162 40
Coal handling suspense	649 68
Prepaid insurance	5,837 41
Prepaid taxes, etc.	5,358 38
Deposits—public authorities performance of contracts	1,000 00
	$868,372 47

The reasonable and necessary working capital employed by plaintiff in its gas business since January 1, 1923, has been, and is, at least $600,000.

20. Plaintiff's gas works, plant and system is a complete, connected, established and operating property, doing business and earning money, and the element of going concern value therein is a property right, independent of the franchise, or of any mere good will as between such plant and its consumers, and such element of going concern is of the fair and reasonable value of $800,000.

21. The land upon which plaintiff's gas holders, shops and yards are located, as aforesaid, was acquired by the Kings County Gas and Illuminating Company in 1890 at a cost of $20,000, and the land upon which plaintiff's manufacturing works are located was acquired by said Kings County Gas and Illuminating Company in 1896 at a cost of $119,000. The total cost to the Kings County Gas and Illuminating Company of all the property owned by it and acquired by the plaintiff upon its merger July 1, 1904, as shown by the books of said Kings County Gas and Illuminating Company was $2,441,997.40. The investment of plaintiff and its predecessor, with land at its then present market value, in the property owned by the plaintiff at December 31, 1923, exclusive of working capital, was $7,847,212.59, made up as follows:

[fol. 95] Cost to Kings County Gas and Illuminating Company of property existing June 30, 1904	$2,441,997 40	
Less cost of land	139,000 00	
		$2,302,997 40
Net additions to fixed capital July 1, 1904, to December 31, 1923		4,198,603 69
Present value of land		1,345,611 50
		$7,847,212 59

22. The fair and reasonable value of the land, manufacturing plant, distributing system, and all other property, tangible and intangible, owned and used by the plaintiff in its gas business, excepting its franchises, as of June 1, 1923, was and is the sum of $10,635,242, and as of January 1, 1924, was and is the sum of $11,200,656, classified as follows:

Land	$994,002
Manufacturing plant, distributing system and other structural property	8,041,003
Restoring street pavement over mains and services cut by plaintiff in laying the same	97,696
Miscellaneous general equipment	102,541
Working capital	600,000
Going concern value	800,000
	$10,635,242
Cost of additions to fixed capital, June 1, to December 31, 1923	565,414
	$11,200,656

23. The fair, reasonable and proper rate of return on the value of the property which plaintiff owns, uses and employs for the convenience of the public to which plaintiff is entitled, and which is necessary in order that such return may equal that generally being made at the date and for the period of the inquiry in the City of New York on investments in other business undertakings which are attended by corresponding risks and uncertainties, and which will be reasonably sufficient to assure confidence in the financial

soundness of the plaintiff and adequate under efficient and [fol. 96] economical management to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties, was and is not less than 8 per centum per annum.

24. In the year ended December 31, 1923, plaintiff manufactured 1,977,410,000 cubic feet of gas, and its sales were 1,794,969,872 cubic feet. The actual total cost to plaintiff, including the expenses incident to the sale of gas appliances, in manufacturing and distributing said gas was $1,640,279.49, or 91.38 cents per thousand cubic feet of gas sold, made up as follows:

		Cts. per M
Production expenses	$892,501 13	49 73
Distributing expenses	143,636 40	8 00
Street lighting expenses	915 94	05
Commercial expenses	124,461 36	6 93
Promotion expenses	49,423 58	2 75
General expenses	156,651 13	8 72
Retirement expense	53,990 21	3 00
Federal income tax	68,303 61	3 81
Other taxes	140,987 02	7 86
Uncollectible bills	9,409 11	53
Total operating expenses	$1,640,279 49	91 38

25. The expenses incurred by plaintiff in the manufacture and sale of gas in the year ended December 31, 1923, stated in the preceding finding do not include any charge for depreciation. The only charge made over and above the actual expense for repairs is 3 cents per thousand cubic feet of gas sold to provide for the retirement of fixed capital or plant withdrawn from service, which for the purpose of this case I have reduced to 1½ cents. Such expenses do not include any charge or expenditures by the plaintiff for interest upon its bonds, temporary loans, consumers' deposits, or other indebtedness, and include no return upon the capital or property employed in any form whatsoever. The expenditures so made, as herein modified, were reasonable and necessary.

[fol. 97] 26. Plaintiff's sales of gas for the year ended December 31, 1924, were 1,947,207,840 cubic feet, an increase

of 152,237,968 cubic feet over the sales for 1923. Such increase in sales does not reduce the unit (1,000 cubic feet) cost of manufacturing and distributing gas. Reductions in the unit cost in 1924 are limited to those occasioned by the slightly lower costs of gas oil, which is the largest item in the expense of making gas, and generator fuel under existing contracts which covered plaintiff's requirements for the year 1924. The average cost, including handling charges, of the gas oil per gallon was 5.2089 cents in 1923, and 4.75475 cents in 1924. The average cost, including handling charges, of generator fuel per long ton was $10.062 in 1923, and $9.9673 in 1924. The gas oil and generator fuel used in 1923 at the contract prices for 1924 would have cost $28,298.50, or 1.58 cents per thousand cubic feet of gas sold, less than was actually paid for the same, making the cost to produce and distribute gas, exclusive of federal income tax and by reducing the retirement expense to 1½ cents, 84.50 cents per one thousand cubic feet of gas sold.

27. Since October 1, 1922, plaintiff has supplied gas in compliance with an order of the Public Service Commission of the State of New York dated August 30, 1922, fixing a monthly average of 537, and a minimum of 525, British thermal units per cubic foot. The gas furnished by plaintiff, as tested by the Public Service Commission, in the twelve months of 1923 showed the following monthly averages in British thermal units per cubic foot: 538, 546, 553, 549, 545, 547, 550, 558, 548, 547, 543 and 543.

28. In the manufacture of gas in 1923 plaintiff used 2.83 gallons of gas oil, 33.98 pounds of generator fuel and 5.24 [fol. 98] pounds of solid boiler fuel per thousand cubic feet of gas made. The increase in the heat content of gas is effected through the use of additional gas oil, resulting in a slight reduction in the quantities of generator and boiler fuel required and an increase in the amount of water gas tar recovered. To furnish gas of 650 British thermal units, tested one mile from the plant, would require not less than 4.65 gallons of gas oil, 32 pounds of generator fuel and 3.98 pounds of solid boiler fuel per thousand cubic feet of gas made. In plaintiff's actual operations, with the use of 2.83 gallons of gas oil per thousand cubic feet of gas made, an average of 8 per cent of the gas oil is recovered as water gas tar, but with the use of 4.65 gallons of gas oil per thou-

sand cubic feet in the manufacture of the higher heat content gas, the recovery would approximate 16 per cent of the gas oil used, or an increase of approximately .47 of a gallon of water gas tar per thousand cubic feet of gas made. The increase in the cost of furnishing gas of 650 British thermal units per cubic foot instead of the gas furnished by plaintiff since January 1, 1923, at the present prices of material, is not less than 5.44 cents per thousand cubic feet of gas sold, computed as follows:

1.82 additional gallons gas oil at 4.75475 cents		8.65 cents.
1.98 less pounds generator fuel at .469 cents	.89 cents.	
1.26 less pounds solid boiler fuel at .415 cents	.54 "	
.47 additional gallons water gas tar recovered at 4.75475 cents	2.23 "	
		3.66 "
Net increase in cost per thousand made		4.99 "
Net increase in cost per thousand sold		5.44 "

29. Had a rate of $1.00 per thousand cubic feet for gas [fol. 99] of the standard furnished by plaintiff been enforced against plaintiff, there would have been available for return upon the property employed by plaintiff for the year ended December 31, 1923 but $329,028.01, computed as follows:

		Cts. per M
Sales of gas at $1.00 per thousand.	$1,794,969.87	100.00
Miscellaneous operating revenue	81,958.28	4.57
Total operating revenue	$1,876,928.15	104.57
Operating costs, exclusive of federal income tax	1,545,051.33	86.08
Income applicable to federal income tax and return on property	$331,876.82	18.49

Bond interest income deduction	$275,380.00		
Other income deductions	33,706.35		Cts. per M
		309,086.35	17.22
		$22,790.47	1.27
Federal income tax		2,848.81	.16
Income available for return on property		$329,028.01	18.33

30. No federal income tax would have been payable by plaintiff for the year ended December 31, 1923, had plaintiff furnished gas of 650 British thermal units at the rate of $1.00 per thousand cubic feet, and there would have been available for return upon the property employed by plaintiff but $234,230.26, computed as follows:

		Cts. per M
Sales of gas at $1.00 per thousand.	$1,794,969.87	100.00
Miscellaneous operating revenue	81,958.28	4.57
Total operating revenue	$1,876,928.15	104.57
Actual operating costs, exclusive of federal income tax	1,545,051.33	86.08
Increase in costs for 650 B. T. U. gas	97,646.56	5.44
Total operating expenses exclusive of federal income tax	$1,642,697.89	91.52
Income applicable to federal income tax and return on property	$234,230.26	13.05
Income deductions	309,086.35	17.22

31. Had a rate of $1.00 per thousand cubic feet for gas of the standard furnished by plaintiff been enforced against [fol. 100] plaintiff, the probable revenue available for return upon the property employed by plaintiff for the year

ended December 31, 1924, would not have exceeded $374,439.38, computed as follows:

	Amount	Cts. per M
Sale of Gas at $1.00 per thousand	$1,947,207.84	100.00
Miscellaneous Operating Revenue	81,958.28	4.21
	$2,029,166.12	104.21
Operating Expenses, exclusive of Federal Income Tax	1,645,390.59	84.50
Income available for Federal Income Tax and Return on Property	$383,775.53	19.71
Income Deductions:		
Interest on bonds. $275,380.00		
Other Income Deductions 32,706.35		
	309,086.35	15.87
	$74,689.28	3.84
Federal Income Tax	9,336.15	.48
Income Available for Return on Property	374,439.38	19.23

32. No Federal income tax would have been payable by plaintiff for the year ended December 31, 1924, had plaintiff furnished gas of 650 British thermal units at the rate of $1.00 per thousand cubic feet, and the probable revenue available for return on the property employed by plaintiff would not have exceeded $277,847.39, computed as follows:

	Amount	Cts. per M
Sale of Gas at $1.00 per thousand	$1,947,207.84	100.00
Miscellaneous Operating Revenue	81,958.28	4.21
	$2,029,166.12	104.21
Operating Expenses, exclusive of Federal Income Tax	1,751,318.73	89.94
Income available for Federal Income Tax and Return on Property	$277,847.39	14.27

Income Deductions:		Amount	Cts. per M
Interest on bonds.	$275,380.00		
Other Income Deductions	33,706.35		
		309,086.35	15.87

[fol. 101] 33. At no time since the enactment of chapter 899 of the laws of 1923, would the rate of $1.00 per thousand cubic feet for gas of the standard supplied by plaintiff have yielded a return of as much as 3½ per cent per annum on the fair value of the property employed by plaintiff in the public service. At no time since the enactment of said chapter would the rate of $1.00 per thousand cubic feet for gas of the standard prescribed thereby have yielded a return of as much as 2½ per cent per annum on the fair value of the property employed by the plaintiff in the public service. The rate of $1.00 per thousand cubic feet for gas, whether of the heat content actually supplied by plaintiff, or of the heat content prescribed by said act, was, and is, confiscatory and will continue to be so.

34. Efficient and satisfactory service can only be rendered by plaintiff, or by any other gas company, by supplying its consumers with gas of a substantially uniform heat content. Gas appliances will not ordinarily allow for a variation of more than 25 British thermal units either way from the mean heat content for the utilization of which they are adjusted. Gas of as high heat content as that prescribed by chapter 899 of the laws of 1923 has never been supplied anywhere for general industrial and domestic uses, and it is uncertain with what degree of uniformity of heat content it could be produced at the manufacturing plant, but it is certain that it could not be produced with the same degree of uniformity as gas of a lower heat content such as that prescribed by the order of the Public Service Commission dated August 30, 1922. Gas of the higher heat content contains larger percentages of condensible hydrocarbons than gas of the lower heat content, and even if it [fol. 102] were produced with a fair degree of uniformity at the plant it would necessarily be affected by changing temperature conditions in the holders and street mains, producing wide variations in the heat content and conse-

quent inefficient and unsatisfactory service. Variations in heat content might be as many as 200 British thermal units and become a real hazard and menace to the lives and health of the inhabitants. When gas having a heat content of 30 British thermal units per cubic foot more than the appliances are adjusted to consume, is applied to cooking utensils, incandescent lighting mantles, the interior of ranges and other heated surfaces, such as boiler tubes and water heater coils, the combustion is incomplete, thereby causing such heated surfaces to become coated with an increasing deposit of carbon, which reduces the efficiency of the gas flame and causes serious hazards to life by the release of poisonous gases.

35. At the time of the enactment of chapter 899 of the laws of 1923, the gas appliances of plaintiff's consumers were, and still are, adapted or adjusted to utilize economically and efficiently gas of an average of 537 British thermal units per cubic foot, with a variation of 25 British thermal units above or below said average. Were it possible to supply gas of as high heat content as that prescribed by said chapter without producing wide variations in the heat content of the gas supplied and without a resulting unsatisfactory service, it would still be necessary before plaintiff undertook to furnish gas conforming to such standard to have all the various gas appliances used by plaintiff's consumers changed and adjusted so as to adapt them to the use of such gas; otherwise there would result great loss of life [fol. 103] and property from asphyxiations and explosions. Many of the appliances in use in plaintiff's district are not adjustable and would have to be discarded, requiring the purchase by plaintiff's consumers of new appliances. No obligation is cast upon the plaintiff by any statute or rule of law to enter upon the premises of its consumers and adjust their appliances for the utilization of gas of any particular standard, nor is a practicable means prescribed anywhere to bring about the adjustment of the consumer's appliances and the purchase of new ones where necessary, so as to make it possible or safe now, or hereafter, for plaintiff to undertake the furnishing of gas of the heat content prescribed by chapter 899 of the laws of 1923.

36. It is within the recognizable police power of the state, either by statute or regulation of a duly authorized commission, to prescribe a standard for gas supplied for general industrial and domestic uses; otherwise uniformity in heat content so essential to satisfactory and efficient service would be unenforceable; also the power of regulating the rate or price necessarily carries with it the power or right to prescribe the standard or quality of the gas. But the exercise of this power like every other power must be reasonable and in the interests of the public by way of safeguarding the health, protecting the morals or promoting the general welfare of the community. The requirement of chapter 899 of the laws of 1923 to the effect that plaintiff shall not "furnish gas of a standard less than six hundred and fifty British thermal units per cubic foot, measured under normal conditions of temperature and atmospheric pressure" neither safeguards the health, protects the morals nor promotes the general welfare; but on the contrary [fol. 104] the furnishing of gas of such heat content would tend to, and actually would, imperil the life and health of the inhabitants and subject their property to unnecessary risks and hazards. Not one advantage either to plaintiff or to its consumers, individually or collectively, is secured by such a requirement. Compliance with the requirement is impracticable and impossible. Attempted compliance would only result in inefficient service and consequent dissatisfaction on the part of plaintiff's consumers, engendering a prejudice among them against plaintiff over a situation beyond its control, and plaintiff would suffer irreparable injury and damage in the loss of the goodwill of its consumers.

I therefore recommend:

1. That it be adjudged and decreed that chapter 899 of the laws of 1923 of the State of New York, in so far as it limits the rate to be charged for gas supplied by plaintiff in the territory served by it, is confiscatory and deprives plaintiff of its property without due process of law, contrary to the Fourteenth Amendment to the Constitution of the United States.

2. That it be adjudged and decreed that the enforcement of said statute, in so far as it prescribes a rate or price to be charged for gas supplied by plaintiff, be in all respects suspended and restrained.

3. That it be adjudged and decreed that chapter 899 of the laws of 1923, in so far as it prescribes that plaintiff shall not furnish gas of a standard less than six hundred and fifty British thermal units per cubic foot, measured under normal conditions of temperature and atmospheric pres- [fol. 105] sure, is not a reasonable exercise of the police power of the State in respect to prescribing the standard for gas supplied or to be supplied by the plaintiff and deprives the plaintiff of its property without due process of law, contrary to the Fourteenth Amendment to the Constitution of the United States.

4. That it be adjudged and decreed that defendants, William A. Prendergast, William R. Pooley, Charles Van Voorhis, George R. Lunn and George R. Van Namee, constituting the Public Service Commission of the State of New York and Albert Ottinger as Attorney-General of the State of New York, and each of them, their, and each of their, successors, attorneys, agents, assistants, deputies, servants and employees be, and each of them be, restrained and enjoined from enforcing the provisions, or any of them, of said chapter 899 of the laws of 1923, and from instituting, or causing to be instituted, any suit, action or proceeding to enforce the said statute, or any provision thereof, or from taking any action under any other statute or law of said State to compel or enforce obedience to the said statute, or any provision thereof, and from interfering with plaintiff in charging, billing and collecting a rate or charge in excess of that fixed by said statute for gas supplied to its consumers, other than the City of New York, and from interfering with plaintiff in furnishing and supplying gas of a standard or quality different from that fixed by said statute.

Dated April 15, 1925.

Respectfully submitted.

Almeth W. Hoff, Special Master.

[fol. 106] In United States District Court

Notice of Plaintiff's Exceptions to Report of Special Master

Sirs: Please take notice that the within exceptions of the plaintiff, Kings County Lighting Company, to the report of the Special Master herein, were filed this day in the office of the Clerk of the United States District Court for the Eastern District of New York.

Yours, etc., Samual F. Moran, Solicitor for Plaintiff, Kings County Lighting Company, 14 Wall Street, Borough of Manhattan, New York City.

Dated Brooklyn, N. Y., May 9th, 1925.

To Charles G. Blakeslee, Esq., Solocitor for Defendant Public Service ommission of the State of New York, 30 Church Street, Borough of Manhattan, New York City; John Holley Clark, Jr., Esq., Solicitor for Defendant Albert Ottinger, as Attorney General of the State of New York, 120 Broadway, Borough of Manhattan, New York City.

[fol. 107] In United States District Court

[Title omitted]

Plaintiff's Exceptions to Report of Special Master

For plaintiff it is urged for exceptions to the report of the Special Master, filed herein April 20, 1925:

1. The finding in paragraph 19 of the Special Master's report that the reasonable and necessary working capital employed by plaintiff in its gas business is but $600,000 is contrary to, and against the weight of the evidence. The evidence is that the reasonable and necessary working capital so employed by plaintiff has been and is at least $850,000.

2. The finding of the Special Master in paragraph 20 of said report, that the going concern value of, or the element of going concern in, plaintiff's gas works, plant, property and system is of the fair and reasonable value of only $800,-

000 is contrary to, and against the weight of, the evidence. The evidence is that said element of going concern is of the [fols. 108 & 108½] fair and reasonable value of $1,750,000.

3. The finding of the Special Master in paragraph 25 of said report that a charge to operating expenses of 1½ cents per thousand cubic feet of gas sold is sufficient to provide for the retirement of fixed capital or plant withdrawn from service is contrary to and against the weight of the evidence. The evidence is that a charge of 3 cents per thousand cubic feet of gas sold for the purpose aforesaid is proper, reasonable and necessary.

Brooklyn, N. Y., May 8, 1925.

Samuel F. Moran, Solicitor for Plaintiff, 14 Wall Street, Borough of Manhattan, New York City.

[fol. 109] In United States District Court

[Title omitted]

Notice of Attorney General's Exceptions to Report of Special Master

Sirs: Please take notice, that the within is a copy of the Exceptions of the defendant Albert Ottinger, as Attorney-General of the State of New York, to the report of Almeth W. Hoff, Special Master in this action, which exceptions were this day duly filed and entered in the office of the clerk of the United States District Court, for the Eastern District of New York.

Yours, etc., Albert Ottinger, Attorney-General of the State of New York.

Office & P. O. Address: 49 Chambers St., New York City, N. Y.

Dated New York, May —, 1925.

To Samuel F. Moran, Solicitor for plaintiff, 14 Wall St., New York City, N. Y.

[fol. 110] In United States District Court

[Title omitted]

Attorney General's Exceptions to Report of Special Master

Now comes the defendant Albert Ottinger, as Attorney-General of the State of New York, and files the following assignments of error upon which he will rely upon his prosecution of the appeal in the above entitled cause from the decree made by this Honorable Court on the — day of ——, 1925.

1. Defendant excepts to the Findings marked "9" of the Master's report on the ground that the same is contrary to the evidence, not supported by the evidence and against the weight thereof. The witnesses called to testify as to what the property would cost were not qualified and did not use a basis or method of calculation reasonably calculated to obtain accurate figures; and on the further ground that the figures given represent reproduction cost new without proper depreciation; on the further ground that plaintiff in failing to establish by proper proof the amount of actual present depreciation which exists in its plant, and must exist in all plants, has failed to meet that burden of proof which the Supreme Court has held must be established.

[fol. 111] 2. Defendant excepts to the Finding marked "10" of the Master's report which finds as follows:

"The plant, machinery and equipment of the plaintiff have been well maintained, repairs, renewals and replacements having been made as required. Said plant, machinery and equipment are in as efficient operating condition for the economic production of gas as if new,"

on the ground that the same is not supported by the evidence, is contrary to the evidence and is against the weight thereof; and for the further reason that the Findings and Conclusions contained therein are contrary to the sound reasoning and human experience.

Defendant further excepts to so much of the Finding marked "10" of the Master's report reading as follows:

"The uncontradicted evidence shows that an expenditure of $1,855.50 on the buildings and $16,557.92 on the machinery, apparatus and equipment, as of June 1, 1923, would put the same in a condition substantially as good as they were when new,"

on the ground that the same is contrary to the evidence, is not supported by the evidence and against the weight thereof; and on the further ground that the figures are grossly inadequate to measure the depreciation in the buildings, machinery, apparatus and equipment of the plaintiff company.

Defendant further excepts to so much of the Finding marked "10" of the Master's report which reads as follows:

"These amounts deducted from the reproduction cost of the structural property give a reproduction value of $8,941,003,"

[fol. 112] on the ground that the same is contrary to the evidence, is not supported by the evidence and against the weight thereof.

3. Defendant excepts to the Finding marked "19" of the Master's report on the ground that the same is contrary to the evidence, is not supported by the evidence and against the weight thereof; on the further ground that the amounts used in figuring the average monthly working capital are excessive; on the further ground that some of the grounds used in arriving at the average monthly working capital are improper items to be considered; and on the further ground that there is no evidence tending to support the Finding that (p. 61):

"The reasonable and necessary working capital employed by the plaintiff in its gas business since January 1, 1923, has been, and is, at least $600,000;"

and on the further ground that the Master should have found that a fair and reasonable allowance as to working capital reasonably necessary for the needs of the plaintiff is $450,000.

4. Defendant excepts to the Finding marked "20" of the Master's report on the ground that there was no competent evidence before the Master upon which any going concern value could be fixed; and on the further ground that there is no basis in the history of the company for making an allowance for going value whatsoever; and on the further ground that where property is valued, as here, as a going concern and therefore not subject to deduction for depreciation, there is no basis for allowance of going value, even if the history of the company should support such allowance; and on the further ground that the Finding of $800,000 for going concern value is excessive and unreason-[fol. 113] able; and on the further ground that it is contrary to law and disregards the decision of the Supreme Court of the United States in the case of Galveston Electric Company v. City of Galveston. 258 U. S. 388.

5. Defendant excepts to the Finding marked "22" of the Master's report on the ground that the same is not supported by the evidence, is contrary to the evidence and against the weight thereof; and on the further ground that no credits were made for properties withdrawn from service; on the further ground that the cost of the plaintiff's entire property was much below the figure found; and on the further ground that the witnesses called by the plaintiff to testify as to the items going to make up the reproduction cost of the property of the plaintiff were not qualified and did not use the proper basis or method to obtain accurate, fair or reasonable values; and on the further ground that the Master failed to make proper and sufficient allowances for depreciation in the buildings, plants and station and gas holders of the plaintiff company; and on the further ground that the Master gave practically no consideration to the original cost of plaintiff's property; and on the further ground and for the reasons herein before set forth in previous exceptions herein.

6. Defendant excepts to the Finding marked "23" of the Master's report which purports to find the fair, reasonable and proper rate of return on the value of the property which plaintiff owns, uses and employees, was and is not less than than 8 per cent. per annum; on the ground that the same is not supported by the evidence, is contrary

to the evidence and against the weight thereof, and furthermore, is contrary to the law; on the further ground that it was neither the duty nor within the province of the Master [fol. 114] to find what the reasonable and proper rate of return should be.

9. The defendant excepts to the Finding marked "24" of the Master's report on the ground that it is not supported by the evidence, is contrary to the evidence and against the weight thereof; and on the further ground that the cost of gas made for the year 1923, as therein found, is unreasonable and excessive; and on the further ground that the plaintiff failed to prove any reasonable basis for arriving at the cost per gallon charged by it in plaintiff's exhibit number 85 for the water gas tar reported used; and on the further ground that the unit cost is plainly wrong in that it exceeds the rate adopted by the plaintiff as the cost when crediting production expense, the figure of charge being $.0629426 per gallon and the credit being at the rate of $.049957 per gallon; and on the further ground that the amount of water tar gas on hand January 1, 1923, should not be charged as an operating expense in 1923 at the rate of cost for 1922 in order to determine the future cost of making gas; and on the further ground that the amount of recovery of water gas tar from the gas oil used by the plaintiff was inadequate and contrary to the long experience of other gas companies in manufacturing gas, and contrary to the evidence herein given by experts in manufacturing gas; and on the further ground that the Master should have found that the usual percentages of recovery of water gas tar is about 16%, and furthermore, the Master should have used such percentage as a basis in his Finding herein.

10. Defendant excepts to the Finding marked "29" of the Master's report and the computations therein made, on the ground that the same is not supported by the evidence, is [fol. 114½] contrary to the evidence and against the weight thereof; and on the further ground that the figures for expenses therein stated are too high per thousand cubic feet sold, because of the Master's failure to readjust plaintiff's figures on account of the fact that the credit for tar is too low for all the reasons set out in Exception marked "9" above.

11. Defendant excepts to the Finding marked "31" of the Master's report and the computations therein made, on the ground that the same is not supported by the evidence, is contrary to the evidence and against the weight thereof; and on the further ground that the figures for expenses therein stated are too high per thousand cubic feet sold, because of the Master's failure to readjust plaintiff's figures on account of the fact that the credit for tar is too low for all the reasons set out in Exception marked "9" above.

12. Defendant excepts to the Finding marked "32" of the Master's report and the computation therein contained, on the ground that the same is not supported by the evidence, is contrary to the evidence and against the weight thereof; and on the further ground that the figures for expenses therein stated are too high per thousand cubic feet sold, because of the Master's failure to readjust plaintiff's figures on account of the fact that the credit for tar is too low for all the reasons set out in the Exceptions marked "9" above.

13. Defendant excepts to the Finding marked "33" of the Master's report, which finds that the statute in question is confiscatory, on the ground that the same is not sup- [fol. 115] ported by the evidence, is contrary to the evidence and against the weight thereof and contrary to law; and for the further reasons herein set forth in these exceptions.

14. Defendant excepts to the Finding marked "34" of the Master's report on the ground that it is not supported by the evidence, is contrary to the evidence and there is no evidence tending to support it. The Master should have found that 650 B. T. U. gas is in fact the equivalent of 22-candle power gas which the plaintiff purported to furnish for many years. He should further have found that plaintiff, before October 1922, had furnished gas of a heat content ranging from 500 British thermal units per foot to 650 British thermal units per foot without any adjustment of appliances and without any danger to human life.

15. Defendant excepts to the Finding marked "35" of the Master's report on the ground that it is not supported by the evidence, is contrary to the evidence and there is no

evidence tending to support it; and further on all of the grounds set out in the Exception marked "14" above.

16. Defendant excepts to the Finding marked "36" of the Master's report on the ground that it is not supported by the evidence, is contrary to the evidence and there is no evidence tending to support it; and further on all of the grounds set up in the Exception marked "14" herein.

17. Defendant excepts to the recommendations "1", "2" and "3" on the ground that they are not supported by the evidence, are contrary to the evidence, and against the weight thereof; are contrary to the law involved; and for the further reasons hereinbefore specifically set forth [fol. 116] in these exceptions.

18. Defendant excepts to the opinion of the Master repeating and reiterating, as though herein set forth, any and all of the defendants' exceptions to the Master's Findings of Fact and Conclusions of Law as may apply to the statements in said opinion identical with, similar to or bearing upon such Findings of Fact and Conclusions of Law.

19. Defendant, in addition to the above general exceptions, excepts to so much of the said opinion of the Master on page 50 thereof in which the Master holds that it was not necessary for the plaintiff to actually operate under the statute in question before bringing this suit. The Master should have held that the company should have reduced its rate to that fixed in the statu-e on the day such statu-e went into force, and should have complied with the standard provisions of such statu-e as soon thereafter as practicable.

20. Defendant, in addition to the above general exceptions, excepts to so much of the Master's opinion as appears on page 12 and states "I have given consideration to the historical or investment cost of the property," on the ground that the Master's report and opinion show that he gave no consideration to such cost in arriving at the fair value of the property.

21. Defendant, in addition to the above general exceptions, excepts to so much of the Master's opinion which purports to calculate the fair value of the properties of the plaintiff company, on the ground that the figures therein

contained are excessive and unreasonable, are contrary to [fols. 117 & 118] the evidence, unsupported by the evidence and against the weight thereof.

22. Defendant, in addition to the above general exceptions, excepts to so much of the Master's opinion as appears on page 32 thereof, and finds in effect that no substantial deduction should be made for depreciation, on the ground that said Finding is contrary to law and to human experience.

23. Defendant, in addition to the above general exceptions, excepts to that part of the Master's opinion appearing on pages 41 to 43 under the title "Gas Standard", on the ground that the conclusions therein stated place a construction on the said statu-e which is erroneous and contrary to the settled principles of law and equity. The Master should have found that the two provisions of the statu-e as to price and quality were and are separable, and if the provision requiring the furnishing of 650 British Thermal Unit gas was found unconstitutional the dollar rate provision nevertheless survived and the plaintiff company thereupon became obligated to furnish gas of a British Thermal Standard as required by Order 108 of the Public Service Commission made and filed August 30, 1922.

Albert Ottinger, Attorney-General of the State of New York. Office & P. O. address: 49 Chambers Street, New York City. John Holley Clark, Jr., Solicitor for Attorney-General Ottinger. Office & P. O. address: 49 Chambers St., New York City, N. Y. Anthony P. Ludden, Special Deputy Attorney-General.

Dated New York, May 9, 1925.

[fol. 119] In United States District Court

[Title omitted]

Notice of Exceptions of Wm. A. Prendergast et al. to Report of Special Master

Please take notice that the within exceptions of the defendants, William A. Prendergast, et al., constituting the Public Service Commission of the State of New York, to the report of the Special Master herein, were filed this day in the office of the Clerk of the United States District Court for the Eastern District of New York.

Charles G. Blakeslee, Solicitor for Defendants, William A. Prendergast et al., No. 30 Church Street, New York City.

Dated Albany, N. Y., May 9th, 1925.

[fol. 120] To Samuel F. Moran, Esq., Solicitor for Plaintiff, 14 Wall Street, New York City; Albert Ottinger, Esq., Attorney General, State of New York; John Holley Clark, Jr., Esq., Solicitor for Attorney-General, 51 Chambers Street, Borough of Manahattan, City of New York.

[fol. 121] In United States District Court

[Title omitted]

Exceptions of the Defendants William A. Prendergast, William R. Pooley, Charles Van Voorhis, George R. Lunn, and George R. Van Namee, Constituting the Public Service Commission of the State of New York, to Report of Special Master

Now come the defendants William A. Prendergast, William R. Pooley, Charles Van Voorhis, George R. Lunn and George R. Van Namee, constituting the Public Service Commission of the State of New York, and except to the findings of fact and conclusions of law contained in the report filed herein by Almeth W. Hoff, Special Master, on [fol. 122] April 20, 1925, in the following particulars, to wit:

First. The defendants except to that part of Finding No. 6 in which the Master in respect to the land located on New York Bay finds that

"the present fair market value of which land without improvements is $1,141,344. Plaintiff's gas works or manufacturing plant is located upon the lands above described and 231,381 square feet of the uplant and 55,073 square feet of the lands under water are used by the plaintiff in the conduct of its business, the present fair market value of which land without said improvements is $811,650,"

upon the ground that said finding is not supported by the evidence and is against the weight thereof.

Second. The defendants except to that part of Finding No. 7 in which the Master finds that the present fair market value without improvements of the parcel of land located at the northwest corner of 9th avenue and 65th street is $23,750; of the parcel located at the northeast corner of 9th avenue and 65th street is $6,300; of the parcel located at the southwest corner of 9th avenue and 65th street is $138,771; of the parcel located at the southeast corner of 9th avenue and 65th street is $13,531 upon the ground that said finding is not supported by the evidence and is against the weight thereof.

Third. The defendants except to that part of Finding No. 9 in which the Master finds that

[fol. 123] "The cost of reproducing the manufacturing plant, distributing system and all other structural property owned and used by the plaintiff in its gas business as of June 1, 1923, at prices for labor and material then prevailing, exclusive of the cost of restoring street pavement over gas mains and gas service pipes, was, and is, at least the sum of $8,059,417, classified as follows:"

and such classification, upon the ground that said amount and the various figures set forth in said finding are excessive, unreasonable and improper and that said finding is based upon an illegal theory of valuation and is not supported by the evidence.

Fourth. The defendants except to all of Finding No. 10 upon the ground that said finding is not supported by the

evidence, is contrary to reason and to common sense and to well established principles of law and that the sums found are excessive, unreasonable and improper, that practically no deduction for depreciation is made and that it is not supported by the evidence.

Fifth. The defendants except to that part of Finding No. 11 in which the Master finds that

"The cost to restore the street pavements then existing over the gas mains and gas service pipes of plaintiff as of June 1st, 1923, at prices for labor and material then prevailing was and is, at least the sum of $1,639,333,"

[fol. 124] upon the ground that such amount is not used by the Master in his valuation and is immaterial and improper and contrary to well established principles of law.

Sixth. Defendants except to that part of Finding No. 15 in which the Master finds that

"The estimated expenditures of plaintiff for main extensions, services and meters from January 1 to December 31, 1924, were $521,786.18,"

on the ground that said amount is speculative and is not supported by the evidence.

Seventh. The defendants except to that part of Finding No. 16 in which the Master finds that plaintiff had entered into a contract for the construction of a five million cubic foot gas holder costing approximately $450,000, on the ground that said gas holder is not used or useful in the public service, that said amount is not used by the Master and is immaterial and improper and contrary to well establish principles of law.

Eighth. Defendants except to Finding No. 17 in which the Master finds that the plaintiff has entered into a contract for the construction of a booster station at an estimated expenditure of $148,674.96, on the ground that the said booster station is not used or useful in the public service, that said amount is not used by the Master in his valuation and is immaterial and improper and contrary to well [fol. 125] established principles of law.

Ninth. Defendants except to Finding No. 18 in which the Master finds that plaintiff has acquired a site on which to

construct an office building, the estimated cost of which is $550,000, on the ground that said building is not used or useful in the public service, that said amount is not accepted by the Master in his valuation and is immaterial and improper and contrary to well established principles of law.

Tenth. Defendants except to that part of Finding No. 19 in which the Master finds

"The average monthly working capital employed by the plaintiff in the year ended December 31, 1923, was $868,372.47,"

on the ground that this amount is made up of accounts not properly included in working capital and that such amounts are unreasonable and excessive and are not supported by the evidence.

The defendants further except to that part of Finding No. 19 in which the Master finds that

"The reasonable and necessary working capital employed by plaintiff in its gas business since January 1, 1923, has been, and is, at least $600,000,"

upon the ground that such amount is arbitrary, unreasonable and excessive and is not supported by the evidence.

Eleventh. The defendants except to that part of Finding No. 20 in which the Master finds that Going Concern Value is a property right and that such element of going concern is of the fair and reasonable value of $800,000, upon the ground that such finding is improper and illegal, that there is no evidence to support it, and that it is con-[fol. 126] trary to the established principles of law involved.

Twelfth. Defendants except to that part of Finding No. 22 in which the Master finds

"The fair and reasonable value of the land, manufacturing plant, distributing system, and all other property, tangible and intangible, owned and used by the plaintiff in its gas business, excepting its franchises, as of June 1, 1923, was and is the sum of $10,635,242, and as of January 1, 1924, was and is the sum of $11,200,656, classified as follows:"

on the ground that said amounts are excessive, unreasonable and improper and that said finding is based chiefly on

reproduction cost new at present day prices and practically without any deduction for depreciation, and in all such respects is unfair, improper and illegal and based upon an illegal theory of valuation and is not supported by the evidence and not in accordance with the established principles of law involved.

Thirteenth. The defendants except to that part of Finding No. 23 in which the Master finds the fair, reasonable and proper rate of return is not less than 8 per centum per annum on the ground that it is excessive and not supported by the evidence.

Fourteenth. The defendants except to Finding No. 24 on [fol. 127] the ground that the figures stated therein and purporting to represent the plaintiff's operating expenses for the year ending December 31, 1923, are excessive and are not supported by the evidence.

Fifteenth. The defendants except to that part of Finding No. 25 in which the Master finds

"The expenditures so made, as herein modified, were reasonable and necessary,"

on the ground that the said finding is not supported by the evidence.

Sixteenth. The defendants except to that part of Finding No. 26 in which the Master finds that the cost of making and distributing gas in 1924 was 84.50 cents per one thousand cubic feet of gas sold upon the ground that the said finding is not supported by the evidence and is against the weight thereof.

Seventeenth. Defendants except to Finding No. 33 upon the ground that the Master in making his computations used improper and excessive figures for plaintiff's operating expenses and improper and excessive amounts for the "fair value" of plaintiff's property, which figures and amounts are not supported by the evidence and are contrary to the established principles of law involved.

[fol. 128] Albany, N. Y., May 9th, 1925.

Charles G. Blakeslee, Solicitor for Defendants, Wm. A. Prendergast et al. Sherman C. Ward, of Counsel.

[fol. 129] UNITED STATES DISTRICT COURT

[Title omitted]

Before Martin T. Manton, Circuit Judge, and Marcus B. Campbell and Robert A. Inch, District Judges, Holding Court pursuant to Section 266 of the Judicial Code

OPINION—June 30, 1925

Bill in equity to have declared unconstitutional and void an act of the legislature of the State of New York fixing the rate to be charged for gas within Chap. 899 of the Laws of 1923.

Samuel F. Moran, Esq., for Plaintiff.
Charles G. Blakeslee, Esq., for Defendant Public Service Commission.
Sherman C. Ward, Esq., of Counsel.
John Holley Clark, Jr., Esq., for Defendant Atty. Genl. Albert Ottinger.

[fol. 130] MANTON, Circuit Judge:

This suit seeks to have declared as unconstitutional and void, Chapter 899 of the Laws of 1923, which reads as follows:

"A gas corporation engaged in the business of manufacturing, furnishing or selling illuminating gas in a city containing a population of one million or over shall not charge or receive for gas furnished or sold in such city a sum per one thousand cubic feet in excess of one dollar, nor furnish in such city gas of a standard less than six hundred and fifty British thermal units per cubic foot, measured under normal conditions of temperature and atmospheric pressure. The Public Service Commission, notwithstanding any other provision of this chapter, shall not allow a rate or charge in the case of such cities in excess of such sum."

This became effective June 2, 1923. It fixed the maximum price of one dollar per thousand cubic feet, and a minimum standard of six hundred and fifty British thermal units per cubic foot, for gas supplied in the territory served by the plaintiff. A temporary restraining order was granted by

the district court on the plaintiff's application on June 6, 1923, and after issue was joined, the special master took testimony and reported that the act was unconstitutional: (1) Because the rate fixed by the statute, if held enforceable, would result in confiscation of plaintiff's property; and (2) because the standard set by the statute of six hundred and fifty British thermal units per cubic foot was impracticable and unsafe and contrary to the power of the Legislature to pass legislation under its police power.

The special master took considerable testimony as to val- [fol. 131] ues of land and plant, working capital, and going value, and reached the conclusion that on December 31, 1923, the fair value of plaintiff's business was $11,200,657. He found that the operating expense of manufacturing gas for this plant was 91.38 cents per thousand feet of gas sold, and he ruled that to sell gas at One Dollar per thousand cubic feet as provided by the statute, amounted to a confiscation. He found that the standard of gas actually furnished was five hundred and thirty-seven British thermal units, and recommended that an eight per cent. return on the fair value should be allowed in fixing the rate at which the gas should be sold. He held that the provisions for a rate and standard in the statute were intended to be inseparable, and that the Legislature intended, in fixing the rate, to fix a standard of gas to be charged for at that rate. He held that to fix such a standard was unreasonable, arbitrary and a destructive enactment not warranted by the police power of the State. These conclusions are challenged by both the Attorney General and the Public Service Commission, by exceptions which each have filed against the Special Master's report. Plaintiff has also filed exceptions, which are now withdrawn.

The principal objections urged are (1) that the plaintiff has not sustained the burden of proof of establishing that the rate fixed by the Legislature amounts to a confiscation of property, and that the requirement of six hundred and fifty British thermal units is impossible of performance and impracticable in giving service to the public in the territory served by it; (2) that error was committed in fixing [fol. 132] the fair value of the property invested and used by the plaintiff in its business at $11,200,656; and (3) in failing to make proper reductions for depreciation; (4) that it

was error in the calculations to make an allowance of $800,000. for going value; (5) that it was error to find that the rate and standard provisions of the chapter were dependent upon each other; and that the Master erred in failing to declare them separable, so that the standard provision may remain as constitutional, even though the rate provision be declared unconstitutional by the court.

We have examined this record, which is voluminous, and are satisfied that the master's conclusion of the fair and reasonable value of the land, manufacturing plant, distributing system, and other property, both tangible and intangible, used and owned by the plaintiff in its gas business, except its franchises, was properly fixed at $11,200,656. as of December 31, 1923. As stated by the Supreme Court:

"The ascertainment of that value (fair value) is not controlled by artificial rules. It is not a matter of formulas, but there must be a reasonable judgment, having its basis in a proper consideration of all relevant facts."

Minnesota rate cases, 230 U. S. 352; Wilcox v. Consolidated Gas Co., 212 U. S. 19; Georgia Ry. & Power Co., 262 U. S. 625.

And it is now settled by many authorities, that rates which are not sufficient to yield a reasonable return upon the value of the property used, at the time it is being used to render the services, are unjust, unreasonable, and confiscatory, and their enforcement deprives the public utility company of [fol. 133] its property, in violation of the Fourteenth Amendment. The master has found that the cost of reproduction of the structural property owned and used by the plaintiff as of June 1, 1923, at the prices then prevailing, exclusive of restoring pavement over mains and services, was at least the sum of $8,059,417. He found from the evidence that the property had been well maintained and was in an efficient state of repair and operating condition, and that it would require an expenditure of only $18,413.43 to put it in condition which was substantially as good as new. To this conclusion exception is taken. The argument is that it is wrong to say that by so slight a repair, the property would have a value as if new. The plaintiff offered proof as to these values, the defendants did not. The mas-

ter has not accepted the full value as the proof of the plaintiff indicates, but has said:

"I have endeavored to ascertain, and the figures found by me attempt to reflect what it would have cost the plaintiff to build and develop its plant and property as it was built and developed, had the same level of prices for materials and labor prevailed throughout the whole period of its construction as prevailed in June, 1923; in other words, to measure and state the investment in the property in the dollar of the present."

and he pointed out that the uncontradicted evidence was to the effect that, to organize a corporation, secure the necessary working capital, and construct the plaintiff's plant and property as it existed on June 1, 1923, but excluding going concern value, it would have cost $13,694,371.

As to the argument on depreciation, answering the argument of the defendants as to failure of the master to con- [fol. 134] sider the depreciation in value, it will be observed that the plaintiff called a witness who testified quite fully on the subject of actual depreciation. He testified as to the condition of the property and plant, stating that it was in as good condition as a new plant, and that with this small expenditure referred to the property would be in as good a condition as if new, and as an operating plant, he stated, it would be better than new. There is testimony as to the observed depreciation and the defendants' witness made no deduction for accrued depreciation. While he said he had not time to examine every item of the property, as would be necessary for him to make an estimate of actual depreciation, it does appear that he had been through the plant, and he said there was new property, and that every repair reasonably required had been made. He said that the gas works, holders, and shop buildings were well preserved and very well maintained. Other than this, we find that the defendants offered no evidence of depreciation.

It is conceded that the plaintiff conducted its business with unusual skill and care. Under this condition of the proof, we agree with the master that, in fixing the amount of fair value as he did, sufficient has been allowed for depreciation. Denver v. Denver Water Co., 246 U. S. 178; Des Moines Gas Co. v. Des Moines, 238 U. S. 153. En-

hanced cost of construction due to the general increase of costs after the erection of a plant, are to be considered in finding fair values. Bluefield Water Works Co. v. Public Service Commission, 262 U. S. 679; Galveston Elec. Co. v. City of Galveston, 258 U. S. 388.

The master, in fixing value of the plaintiff's business, allowed an item of $800,000 for going concern. In rate-[fol. 135] fixing cases, such as we are considering here, the element of going concern is regarded as a property right, independent of the franchise or any mere good will. It must be considered in determining the value of the property upon which the owner has a right to make a fair return. Omaha v. Omaha Water Co., 218 U. S. 180; Denver v. Denver Water Co., supra; Des Moines Gas Co. v. Des Moines, supra. This going value of its property cannot be taken from it, except by due process of law. Plaintiff is entitled to the enjoyment thereof, and where it exists it must be considered in determining the reasonableness or unreasonableness of a rate charge, or where it is proposed to be charged.

The evidence fully warrants the conclusions of the master as to the amount of money required as working capital.

We think the language of the statute fixing the rate and fixing the standard are inseparable. They should be read together. To fix a standard which is not practicable, and, indeed, unsafe, is an arbitrary and unreasonable exercise of the police power. The phrase, "nor furnish in such city gas of a standard less than six hundred and fifty British thermal units per cubic foot, measured under normal conditions of temperature and atmospheric pressure," describes the character of the gas which is to be furnished at the rate of One Dollar per thousand feet. The rate fixed is the compensation for supplying this standard of gas. Four witnesses, thoroughly competent and experienced in the gas industry, gave testimony which in substance points out that there is danger or hazard in increasing the content [fol. 136] to six hundred and fifty British thermal units. The danger is pointed out as follows:

"Q. Occasioned by what circumstances?

A. By the difficulty of maintaining a uniform quality, when you get into the high B. t. u. values; for instance, a sudden change in temperature, a hailstorm on a holder full

of gas, would knock the B. t. u.'s down. If you were living up to a 650 B. t. u. standard, you would have to make immediately something much higher, and deliver adjacent to the plant a good deal more than 650, while on the outlying districts the variations would be very great; and close to the holder station it would be equally great, I think, because you cannot make gas and mix it thoroughly in a holder, it stratifies and short circuits between inlet and outlet pipes, and some consumers close to the works might be getting 700 B. t. u. gas, and then within 24 hours, they might be getting 600, and there is the danger."

They pointed out that there would be danger from the weak gas, but there would be more of a chance from the explosion in a variation of the quality of the high gas, and that it would not be practicable, so far as distribution is concerned, because of the necessary changes in the appliances. In view of this testimony, we think the conclusion of the master, holding that the standard prescribed is unreasonable and arbitrary, and that therefore the enactment is destructive, and not warranted by the police power of the State, finds support in the evidence and justifies our confirmation.

After the entry of the decree adjudging the statute to be in violation of the Constitution, the Commission order of [fol. 137] August 30, 1922 fixing a maximum rate of $1.30 "on and after the 1st day of November, 1922, and until the 31st of October, 1923, and thereafter until the Commission shall otherwise order" will continue to control the plaintiff. The plaintiff, of course, if so advised, may file its schedules with the Public Service Commission and petition for an increase in rate. But under the Public Service Commission law, Sec. 66, sub. div. 12, it might not charge a higher rate until the Commission permits it. The master has suggested, as a reasonable rate of return, not less than eight per cent. The master had in mind that any rate lower than eight per cent, return would be confiscatory. But the master's report deals with present fair values. Of course, if, when the new rate is fixed, values have changed, the Public Service Commission may make such new rate based upon evidence, and will be wholly unhampered by the findings or recommendations of the master. Lincoln v. Lincoln,

250 U. S. 268. But we approve the values arrived at by the master, and likewise the recommendation as to the rate of return, below which, if a rate be fixed, would be confiscatory. It is upon these conclusions as to values that the master has found the statute confiscatory, and in this we agree.

The report is therefore approved and affirmed.

(Signed) Martin T. Manton, Circuit Judge. Marcus B. Campbell, District Judge. Robert A. Inch, District Judge.

Dated New York City, June 30th, 1925.

[fol. 138] In United States District Court

[Title omitted]

Judgment—August 24, 1925

This cause came on to be heard at this term, convened in accordance with section 266 of The Judicial Code, and was argued by counsel; and thereupon, upon consideration thereof, it was unanimously ordered, adjudged and decreed as follows, viz:

(1) That the report, dated April 15, 1925, of Almeth W. Hoff, Esq., Special Master, be and the same hereby is in all [fol. 139] respects approved and confirmed, and the several exceptions of the respective defendants thereto overruled;

(2) That chapter 899 of the laws of 1923 of the State of New York, in so far as it limits the rate to be charged for gas supplied by plaintiff in the territory served by it, is confiscatory and deprives plaintiff of its property without due process of law, contrary to the Fourteenth Amendment to the Constitution of the United States;

(3) That chapter 899 of the laws of 1923, in so far as it prescribes that plaintiff shall not furnish gas of a standard less than six hundred and fifty British thermal units per cubic foot, measured under normal conditions of temperature and atmospheric pressure, is not a reasonable exercise of the police power of the State in respect to prescribing the standard for gas supplied or to be supplied by the plaintiff

and deprives the plaintiff of its property without due process of law, contrary to the Fourteenth Amendment to the Constitution of the United States;

(4) That defendants, William A. Prendergast, William R. Pooley, Charles Van Voorhis, George R. Lunn and George R. Van Namee, constituting the Public Service Commission of the State of New York and Albert Ottinger, as Attorney General of the State of New York, and each of them, their, and each of their successors, attorneys, agents, assistants, deputies, servants and employees, be, and each of them hereby is, restrained and enjoined from enforcing the provisions, or any of them, of said chapter 899 of the laws of 1923, and from instituting, or causing to be instituted, any suit, action or proceeding to enforce the said [fol. 140] statute, or any provision thereof, or from taking any action under any other statute or law of said State to compel or enforce obedience to the said statute, or any provisions thereof, and from interfering with plaintiff in charging, billing and collecting a rate or charge in excess of that fixed by said statute for gas supplied to its consumers, other than the City of New York, and from interfering with plaintiff in furnishing and supplying gas of a standard or quality different from that fixed by said statute;

(5) That nothing contained herein shall be construed to limit, prejudice or restrict the exercise of the jurisdiction and power of the Public Service Commission of the State of New York under chapter 480 of the laws of 1910 as amended and supplemented, known as the Public Service Commission Law, or any other provisions of law, not in conflict with the provisions of this decree;

(6) That the plaintiff recover of and from the defendants its taxable costs and disbursements, including the sum fixed and allowed as the compensation and disbursements of the Special Master, to be equally borne and paid by the Public Service Commission and the Attorney General in accordance with the rules of the Supreme Court of the United States on this subject.

Martin T. Manton, Circuit Judge. Marcus B. Campbell, District Judge. Robert A. Inch, District Judge.

[fol. 141] IN UNITED STATES DISTRICT COURT

[Title omitted]

SUMMONS ON PUBLIC SERVICE COMMISSION TO JOIN IN APPEAL, ETC.

To the defendants William A. Prendergast, William R. Pooley, Charles Van Voorhis, George R. Lunn, and George R. Van Namee, constituting the Public Service Commission of the State of New York:

Please take notice that you are hereby summoned to join with me, Albert Ottinger, the Attorney-General of the State of New York, as a co-defendant in the above entitled cause on or before the 7th day of December, 1925, to prosecute an appeal in said cause from the decree and judgment of the United States Court, held pursuant to section 266 of the Judicial Code, for the Eastern District of New York, entered in the office of the clerk of said Court on the 9th day of September, 1925, to the United States Supreme Court, appealing to said court to reverse the said judgment and decree of the United States District Court entered against the defendants herein upon the date mentioned.

[fols. 142 & 142½] You are further notified that in case of failure on your part to join me in said appeal the same will be regarded as an acquiescence on your part in said judgment and decree, and I shall thereupon enter an order of severance against you in the above entitled cause and shall prosecute said appeal without you.

You are further notified that on the 7th day of December, 1925, at ten o'clock in the forenoon of that day or as soon thereafter as counsel can be heard, I will present my petition for leave to appeal in the above entitled cause to Hon. Marcus B. Campbell, a Judge of the District Court of the United States for the Eastern District of New York, at his chambers in the post-office building, County of Kings, State of New York, at which time and place you may join with me in said petition and in default of your joining, ap-

plication will be made for an order of severance against you, as aforesaid.

John Holley Clark, Jr., Solicitor for defendant Ottinger, as Attorney-General.

Office & P. O. address: 49 Chambers Street, Borough of Manhattan, City of New York.

Dated New York, December 2d, 1925.

[fol. 143] In United States District Court

[Title omitted]

Assignments of Error of Defendant Ottinger

Now comes the defendant Albert Ottinger, as Attorney-General of the State of New York, and files the followwing Assignments of Error upon which he will rely upon his prosecution of the appeal in the above entitled cause from the decree made by this Honorable Court on the 9th day of September, 1925.

1. That said Court erred in sustaining the report of the Special Master, in denying the motion of the defendant at the end of the plaintiff's case to dismiss the bill of complaint and overruling the exception of the defendant to such denial.

2. That said Court erred in sustaining the report of the Special Master, in denying the motion of the defendant at the end of plaintiff's whole case to dismiss the bill of com plaint and overruling the exception of defendant to such denial.

3. That said Court erred in confirming the report of the Special Master in so far as said report in Finding "9" [fol. 144] thereof, and in the opinion found that in reproducing plaintiff's plant the costs of the following items would be as stated, to wit:

"Engineering, superintendents and general contractor's expense and profit	$317,536
Interest during construction	421,623
Taxes during construction	25,646
Administration, legal and miscellaneous general expenses during construction	127,014
	$8,059,417

on the ground that the said amounts are unreasonable and excessive and have no sufficient evidence to support them.

4. That said Court erred in confirming the report of the Special Master in so far as said Special Master in Finding "10" and in the opinion found that plaintiff's plant, machinery and equipment are in as efficient operating condition as if new and that an expenditure of $18,414 would put the same in a condition substantially as good as they were when new, on the ground that the said Finding was not supported by credible evidence, is contrary to sound reason, to the law and to human experience.

5. That said Court erred in confirming the report of the Special Master in so far as said Special Master in Finding marked "20" and in the opinion found "going value" to be of a value of $800,000, on the ground that there was no competent evidence before the Master upon which any going concern value could be fixed; and on the further ground that there is no basis in the history of the company for making an allowance for going value whatsoever; and on the further ground that where property is valued, as here, as a going concern and therefore not subject to deduction for depreciation, there is no basis for allowance of going value; and on the further ground that the Finding of $800,000 for going concern value is excessive and unreasonable; and on the further ground that it is contrary to law [fol. 145] and disregards the decision of the Supreme Court of the United States in the case of Galveston Electric Company v. City of Galveston, 258 U. S. 388.

6. That said Court erred in confirming the report of the Special Master in so far as said Special Master in finding marked "22" and in the opinion found the fair value of plaintiff's property to be $11,200,656 on the ground that

the said figure and the items of which it is made up are excessive, in that not sufficient, if any, consideration is given to original cost of construction, to the value and amount of capital stocks or to any element which should enter into fixing fair value for rate making purposes, with the exception of reproduction cost new without deducting depreciation, and that said amounts found as fair value too nearly approximate such calculations as to cost of reproduction new which are themselves excessive, in the particulars above stated in Assignments numbered "3" and "4."

7. That said Court erred in confirming the report of the Special Master in so far as said Special Master in Finding "23" and in the opinion found the fair, reasonable and proper rate of return on the value of the property which plaintiff owns, uses and employs, was and is not less than 8 per cent. per annum; on the ground that the same is not supported by the evidence, is contrary to the evidence and against the weight thereof, and furthermore, is contrary to the law; on the further ground that it was neither the duty nor within the province of the Master to find what the reasonable and proper rate of return should be.

[fol. 146] 8. That said Court erred in confirming the report of the Special Master in so far as said Special Master in Finding "24" and in the opinion found the cost of making and distributing gas for the year 1923 to be 91.38 cents per thousand, made up of the items stated in said Finding, on the ground that the cost of gas made for the year 1923, as therein found, is unreasonable and excessive in that the plaintiff failed to prove any reasonable basis for arriving at the cost per gallon charged by it in plaintiff's exhibit number 85 for the water gas tar reported used; and on the further ground that the unit cost is plainly wrong in that it exceeds the rate adopted by the plaintiff as the cost when crediting production expense, the figure of charge being $.0629426 per gallon and the credit being at the rate of $.049957 per gallon; and on the further ground that the amount of water gas tar on hand January 1, 1923, should not be charged as an operating expense in 1923 at the rate of cost for 1922 in order to determine the future cost of making gas; and on the further ground that the amount of recovery of water gas tar from the gas oil used by the plain-

tiff was inadequate and contrary to the long experience of other gas companies in manufacturing gas, and contrary to the evidence herein given by experts in manufacturing gas; and on the further ground that the Master should have found that the usual percentages of recovery of water gas tar is about 16% and furthermore, the Master should have used such percentage as a basis in his Finding herein.

9. That said Court erred in confirming the report of the [fol. 147] Special Master in so far as said Special Master in Findings "29" and "30" and in the opinion found that the amount available for return for the year 1923 at the statutory rate would be but 18.33 cents per thousand cubic feet of gas sold for 537 B. T. U. gas and 13.05 cents per thousand for 650 B. T. U. gas, on the ground that the figures on which such findings are based do not take into account or make any readjustment for the improper method of crediting water gas tar as above stated and on the further ground that said Finding is contrary to the evidence and against the weight thereof.

10. That said Court erred in confirming the report of the Special Master in so far as said Special Master in Findings "31" and "32" and in his opinion found that the amount available for return for the year 1924 at the statutory rate would be but 19.23 cents per thousand cubic feet of gas sold for 537 B. T. U. gas and 14.27 cents per thousand cubic feet of gas sold for 650 B. T. U. gas, on the ground that the Master should have followed the calculations of defendants' witness Little as to the proper costs of production and distribution for this year; on the further ground that the costs of production and distribution found by the Master and by the Court are excessive and unreasonable, are not supported by the evidence and contrary to the weight thereof, and do not take into account or make any readjustment for the improper method of crediting water gas tar as above set forth.

11. That said Court erred in confirming the report of the Special Master in so far as said Special Master found as set out in Finding "33" and in such parts of the opinion as touch upon the confiscatory nature of the statute on the ground that said Finding is contrary to the evidence and

[fol. 148] to the weight thereof and on all the grounds hereinabove set forth.

12. That said Court erred in confirming the report of the Special Master insofar as the said Special Master found as set out in Finding "34" and in such parts of the opinion as touch upon the supposed hazard to human life in furnishing gas of the statutory standard of 650 British Thermal Units per foot, on the ground that the said Findings are contrary to the evidence and against the weight thereof. The Master and the Court should have found that 650 British Thermal Units gas is in fact equivalent to 22-candle power gas which plaintiff purported to furnish for many years. They should further have found that plaintiff, prior to October 1, 1922, had furnished gas of a heating content ranging from 500 British Thermal Units per foot to 650 British Thermal Units per foot without any adjustment of appliances or without any danger to human life.

13. That said Court erred in confirming the report of the Special Master insofar as the Special Master found as set out in Finding "35" and in such parts of the opinion as touch upon the probable consequences of the plaintiff's complying with the statute and furnishing the standard of gas thereby prescribed, on the ground that the said Findings are not supported by the evidence and against the weight thereof; and on the grounds hereinabove set out in the Assignment of Error marked "12".

14. That said Court erred in confirming the report of the Special Master insofar as said Special Master found as set out in Finding "36" and in such parts of the opinion as lead to the conclusion, that the standard fixed by chapter 899 of the laws of 1923 is unreasonable and would imperil the life and health of the inhabitants and subject their prop- [fol. 149] erty to unnecessary risks and hazards, is impractical, impossible and unconstitutional, on the ground that the said Finding and said portions of the opinion are not supported by the evidence, contrary to the evidence and against the weight thereof, and upon all the grounds hereinabove set forth in Assignment of Error marked "12".

15. The said Court erred in confirming the said report of the Special Master in so far as said Master in his opinion held that he would not take into account in fixing the value of plaintiff's property or make any deduction for the reserve for depreciation and contingencies amounting to $201,910 for the reason that the said Master's ruling in this regard is contrary to the law.

16. That said Court erred in holding as follows: "We think the language of the statute fixing the rate and fixing the standard are inseparable. They should be read together. To fix a standard which is not practicable and, indeed, unsafe, is arbitrary and unreasonable exercise of the police power. The phrase "nor furnish in such city gas of a standard less than six hundred and fifty British Thermal Units per cubic foot, measured under normal conditions of temperature and atmospheric pressure, described the character of the gas which is to be furnished at the rate of One Dollar per thousand feet. The rate fixed is the compensation for supplying this standard of gas," on the ground that said finding is contrary to the evidence and against the weight thereof and is contrary to the law. The Court should have found that the rate and standard are severable and should have been considered separately. The Master and the Court should have attempted to save either the rate or the standard provision if both could not have been found constitutional. If the Court concluded that the standard provision was in and of itself unconstitutional it should have inquired as to the result of applying the statutory rate to gas of a reasonable standard. On the other hand, if the standard were held constitutional, as properly interpreted as it should have been, the Court should have sustained that portion of the statute fixing the standard, [fol. 150] even though the rate provision were declared unconstitutional.

17. That the said Court erred in holding in its opinion as follows:

"But we approve the values arrived at by the master and likewise the recommendation as to the rate of return below which, if a rate be fixed, would be confiscatory. It is upon these conclusions as to values that the master has found the statute confiscatory and in this we agree,"

on the ground that said Finding and Conclusion are contrary to the evidence and contrary to the law. There is no basis for finding that the corporation's property will be confiscated by a rate which does not allow it 8 per cent net return upon approximately the fanciful present reproduction cost of its property without adequate deduction for depreciation.

18. That the said Court erred in its decree dated September 9, 1925, in decreeing as follows:

"(1) That the report dated April 15, 1925, of Almeth W. Hoff, Esq., Special Master, be and the same hereby is in all respects approved and confirmed, and the several exceptions of the respective defendants thereto overruled,"

on the ground that the said decree, in the portion quoted, is contrary to the law, contrary to the evidence and to the weight thereof; and on all the grounds hereinabove set forth in previous Assignments of Errors.

19. That the said Court erred in its decree dated September 9, 1925, in decreeing as follows:

"(2) That chapter 899 of the laws of 1923, of the State of New York, in so far as it limits the rate to be charged for gas supplied by plaintiff in the territory served by it, is confiscatory and deprives plaintiff of its property without due process of law, contrary to the Fourteenth Amendment to the Constitution of the United States,"

on the ground that the said decree, in the portion above [fol. 151] quoted, is contrary to the law, contrary to the evidence and to the weight thereof, and on all the grounds hereinabove set forth in previous Assignments of Errors.

20. That the said Court erred in the decree dated September 9, 1925, in decreeing as follows:

"(3) That Chapter 899 of the laws of 1923, in so far as it prescribes that plaintiff shall not furnish gas of a standard less than six hundred and fifty British Thermal Units per cubic foot, measured under normal conditions of temperature and atmospheric pressure, is not a reasonable exercise of the police power of the State in respect to prescribing the standard for gas supplied or to be supplied by

the plaintiff and deprives the plaintiff of its property without due process of law, contrary to the Fourteenth Amendment to the Constitution of the United States,"

on the ground that the portion of the decree above quoted is contrary to the law, contrary to the evidence and to the weight thereof, and on all of the grounds hereinabove set forth in previous Assignments of Errors.

21. That the said Court erred in the decree dated September 9, 1925, in decreeing as follows:

"(4) That defendants, William A. Prendergast, William R. Pooley, Charles Van Voorhis, George R. Lunn and George R. Van Namee, constituting the Public Service Commission of the State of New York, and Albert Ottinger, as Attorney-General of the State of New York, and each of them, their, and each of their successors, attorneys, agents, assistants, deputies, servants and employees, be and each of them hereby is, restrained and enjoined from enforcing the provisions, or any of them, of said chapter 899 of the laws of 1923, and from instituting, or causing to be instituted, any suit, action or proceeding to enforce the said statute, or any provision thereof, or from taking any action under any other statute or law of said State to compel or enforce obedience to the said statute, or any provisions thereof, and from interfering with plaintiff in charging, billing and collecting a rate or charge in excess of that fixed [fols. 152 & 152½] by said statute for gas supplied to its consumers, other than the City of New York, and from interfering with plaintiff in furnishing and supplying gas of a standard or quality different from that fixed by said statute,"

on the ground that the said decree, in the portion above quoted, is contrary to the law, contrary to the evidence and to the weight thereof, and on all the grounds herein above set forth in previous Assignments of Errors.

Albert Ottinger, Attorney General. Office and P. O. address: Capitol, Albany, N. Y. John Holley Clark, Solicitor for Attorney General.

Dated New York, November 25, 1925.

[fol. 153] IN UNITED STATES DISTRICT COURT

[Title omitted]

PETITION FOR APPEAL

The petition of Albert Ottinger, as Attorney-General of the State of New York, respectfully shows to this court:

First. That Albert Ottinger is the Attorney-General of the State of New York and one of the defendants in this action.

Second. That this is a suit in equity to have declared unconstitutional chapter 899 of the laws of 1923 of the State of New York, on the ground that the rate and quality for gas fixed therein are confiscatory and unconstitutional.

Third. The issues herein were referred to a Special Master and tried before said Special Master. The trial began on or about the 4th day of December, 1923, and continued to on or about the 10th day of June, 1924. The testimony before the said Special Master consisted of approximately four thousand typewritten pages and about one hundred and forty-two exhibits.

Fourth. The Special Master's report was filed in the office of the clerk of the District Court on or about the 20th [fol. 154] day of April, 1925. The defendant Albert Ottinger duly filed exceptions to the Special Master's report in the office of the clerk of the United States District Court.

Fifth. Thereafter the exceptions to the Special Master's report duly came on to be heard before the "Statutory Court" holding Court pursuant to section 266 of the Judicial Code. The final decree of this Court was filed in the office of the clerk of the United States District Court for the Eastern District of New York on the 9th day of September, 1925.

Sixth. That in substance the decree restrains the defendants from enforcing in any way chapter 899 of the laws of 1923 of the State of New York, and declares that said statute violates or is in contravention of section 10 of article

1 and of the Fourteenth Amendment of the Constitution of the United States.

Seventh. The above named defendant Albert Ottinger, as Attorney-General of the State of New York, feeling aggrieved by the aforesaid decree entered on the 9th day of September, 1925, does hereby appeal from said decree to the Supreme Court of the United States for the reasons set forth in the Assignment of Errors herewith filed and prays that his appeal will be allowed and citation issue as provided by law, and that a transcript of the record of proceedings and documents upon which said decree was based, duly authenticated, be sent to the United States Supreme Court at Washington, District of Columbia, under the rules [fols. 155 & 155½] and regulations of such court as made and provided and your petitioner prays that an order be made dispensing with security.

(Signed) Albert Ottinger, Attorney-General of the State of New York. John H. Clark, Jr., C. E. B., Solicitor for Albert Ottinger, Attorney-General of the State of New York.

Dated New York, December 4, 1925.

Office & P. O. address: 49 Chambers Street, Borough of Manhattan, City of New York, N. Y.

Duly sworn to by Albert Ottinger. Jurat omitted in printing.

[fols. 156 & 156½] Citation, in usual form, omitted in printing.

[fol. 157] In United States District Court

[Title omitted]

Petition for Appeal and Order Allowing Same

The defendant Albert Ottinger, as Attorney-General of the State of New York, conceiving himself aggrieved by the decree dated the 9th day of September, 1925, in the above entitled cause, does hereby appeal from said final decree, to the Supreme Court of the United States for the reasons

set forth in the Assignment of Errors filed herewith, and prays that his appeal be allowed and that citation issue as prescribed by law, and that a transcript of the record of proceedings and documents upon which said decrees were based duly authenticated, be sent to the United States Supreme Court, Washington, District of Columbia, under the rules of said court in such cases made and provided, on or before the 6th day of January, 1926, unless the time is further extended; and your petitioner further prays that the bond to cover the costs of appeal be dispensed with.

Albert Ottinger, Attorney-General. John Holley Clark, Jr., Solicitor for Deft., Albert Ottinger, as Attorney-General, etc., 49 Chambers St., New York City, N. Y.

Dated New York, December 4, 1925.

[fol. 158] Appeal allowed. Return of record on appeal to be filed on or before the 6th day of January, 1926, unless time further extended. Defendants William A. Prendergast, William R. Pooley, Charles Van Voorhis, George R. Lunn and George R. Van Namee constituting the Public Service Commission of the State of New York, are hereby severed as parties-defendant.

(Sgd.) Marcus B. Campbell, District Judge, U. S. District Court, Eastern District of New York.

[fol. 159] In United States District Court

[Title omitted]

Statement of Evidence

Brooklyn, New York, December 4, 1923.

Appearances of Counsel

Ingraham, Page & Moran, Solicitors for Plaintiff; Samuel F. Moran, Robert H. Grimes, Travis H. Whitney, of counsel.

Charles G. Blakeslee, Solicitor for defendants William A. Prendergast and others, Public Service Commission, &c.; Edward M. Deegan, Sherman C. Ward, of counsel.

James A. Donnelly, Solicitor for defendant Carl Sherman, Attorney General, &c.; Judson Hyatt, of counsel.

Brooklyn, New York, December 13, 1923.

[fol. 160] Present: Almeth W. Hoff, Special Master; Samuel F. Moran, Robert H. Grimes, and Travis H. Whitney, of counsel for plaintiff; Sherman C. Ward, of counsel for defendant Prendergast; Judson Hyatt, of Counsel for defendant Carl Sherman, Attorney General &c.

MOTION TO DISMISS

Mr. Hyatt: Your Honor, I have a motion to make on behalf of the Attorney General.

The defendant, Carl Sherman, as Attorney General of the State of New York, moves to dismiss the bill of complaint herein on the following grounds:

First: That the plaintiff has failed to show any ground for relief in the Court of Equity in the respect that the plaintiff does not affirmatively allege that it has complied in all respects with the order of the Public Service Commission of the first day of November, 1922.

Second. Because it affirmatively appears in paragraph of the Bill of Complaint marked and numbered "14" that in the year 1922 the plaintiff manufactured 1,845,870,000 cubic feet of gas and sold 1,525,829,435 cubic feet, which represents a loss in "Unaccounted for gas of approximately [fol. 161] 19% of excess of manufacture over that used. This clearly indicates a lack of efficiency in the operation of said plaintiff's plant and represents a loss of 320,040,565 cubic feet of gas, which cost, according to the plaintiff's bill of complaint, approximately $1.05 per thousand cubic feet to manufacture. This would represent a loss in dollars and cents of $336,042, a sum sufficient to pay 6% interest on capital of the amount of $5,600,700. These facts on the admission of the plaintiff alone justify invoking the principle of "He that seeks equity must do equity."

Third. The plaintiff in its bill of complaint makes no allegation that there is no observed depreciation in its plant, but on the contrary alleges in the same paragraph that "there is no charge therein for so-called depreciation". The attention of the Court is directed to the principle enunciated by the United States Supreme Court in the

Minnesota rate cases 230 U. S. p. 352, where the Court states that if there is any depreciation observed in the capital of the plant such depreciation must be noted and accounted for. The plaintiff should have alleged affirmatively that there was no depreciation or if there was depreciation such depreciation was accounted for to the extent of a definite sum.

Fourth. The plaintiff has in the "15", "16", "18" and "19" paragraphs of the Bill of Complaint attached the re- [fol. 162] quirement of the statute assailed in the case at bar as confiscatory; to wit, Chapter 899 of the Laws of 1923 involving besides the rate at which gas should be sold the further requirement of the statute requiring the plaintiff to furnish 650 British Thermal Units per cubic foot of gas sold. This requirement of the statute is without the jurisdiction of the judicial power of the Federal Government and such enactment by the Legislature is exclusively within its prerogatives. Further, the said requirement does not conflict with the provisions of the Federal Constitution and in no way impinges upon it. It is a cardinal principle of equity that it "follows the law" and, further, observance of the law must be shown by those who seek relief in a Court of Equity.

Fifth. The plaintiff urges no ground for equitable relief in the paragraph marked and numbered "17" of the bill of complaint since the judicial power of the Federal Government is not in any way concerned, nor are the provisions of the 14th amendment of the Federal Constitution concerned in giving the plaintiff a rate at which it should sell gas, so as to provide a ready market for its securities.

Sixth. That it affirmatively appears from the facts alleged in the Bill of Complaint and especially under the allegation made in the paragraph marked and numbered "11" that the plaintiff is now charging $1.30 per thousand cubic feet of gas sold by it, and from this it may be fairly [fol. 163] inferred that the plaintiff has made no experimentation with the rate and standard of quality fixed by Chapter 899 of the Laws of 1923, and that therefore there is not alleged sufficient facts to constitute a cause of action in equity against the provisions of the statute.

Upon all and each of the above grounds and reasons the Attorney General moves to dismiss the Bill of Complaint of the plaintiff herein and further moves that the plaintiff be remitted to that experiment without prejudice to a renewal of the said action upon a proper showing that the statute is confiscatory as to it.

Mr. Ward. The defendant Public Service Commission joins in that motion.

The Master. The decision upon the motion is reserved.

[fol. 164] ANDREW J. GONNOUD

Direct:

I am an officer of the plaintiff corporation. I am secretary and general auditor. I have been with the company since 1919, January 1st, acting as auditor since that time. I was acting auditor from January 1, 1919 to August 4, 1919. I was made auditor and assistant secretary. I have charge of the books and records of the company, also charge of its accounting and preparation of its reports to the Public Service Commission and otherwise. I keep a complete set of accounts, under the system prescribed by the Public Service Commission, commonly known as the uniform system of accounts. Just prior to coming with the company I was senior accountant for W. E. Freeman, certified public accountant, at 80 Broadway, and at that time I went over the audit of the books of the Kings County Lighting Company for the year 1917, and completed the audit of that company and took over the systematizing of the work of the Kings County Lighting Company, from that time to June 1, 1919. Prior to that I was general auditor of the Great Western Smelters Corporation in Arizona. I have taken a course in accountancy, with the La Salle Extension University of Chicago. My accounting work goes back to about 1911. At that time I was auditor of passenger accounts of the Copper Range Railway in Michigan. I have prepared statements of the company's operations for dif-
[fol. 165] ferent years, and I got up the one for 1922 which was used on the preliminary injunction. The books are not closed for 1923. They will be closed after the close of the

year, some time about the 15th of January, I expect. The accounts are kept on a yearly basis, for the calendar year. The uniform system does not require that, but in order to submit an annual report to the Public Service Commission, it is necessary that we keep the books for the calendar year. Furthermore, of course, the books are kept for the calendar year on account of change in the seasons of the year, so that we get one complete year at a time. I have charge of these records and reports sent in for services being laid, meters set and all that sort of thing. I keep a complete record in my office. If the service is laid now where you have to cut through a pavement, that fact is noted on the service ticket, and our service ticket would show all kinds of pavement cut through when that service was laid and that has been true all the time with the service ticket. We have a great many service tickets that would show they were laid in dirt construction originally.

Some of the dirt streets in which services were laid have been paved, over a service originally laid on a dirt sheet. My permanent records would not show anything about that change. There is nothing in my permanent record that [fol. 166] would show that after a service was laid in a dirt street, or that a service was laid under macadam later and the street was surfaced with block pavement. It would not show all that. I have not classified my records as services laid before the pavement or laid after the pavement, but I have done something to determine that. The result is on the sheet which is marked as 6 on Plaintiff's Exhibit No. 3 marked for identification. That purports to show the number of services under the different kinds of paving. This is just the service, as distinguished from mains. From the information given by Mr. Schenck, and from the paving book, I determined the streets on which there were no paving, in other words, the dirt streets at the present time. I made a list of—the dirt streets and the number of services in such dirt streets were counted from the card record of the services in the company's files. Having then determined the number of the different size services laid in dirt streets, I subtracted those amounts from the total number of services of different sizes, that had been made as of June 1st, under all classes of paving, including dirt; that is the total number of services the company had installed at

that date. I counted the number of services on dirt streets from my record. It shows opposite the word dirt. I counted the number of services under dirt streets; I sub- [fol. 167] tracted them from the total number of services under dirt streets and all sorts of pavements, and that gave me the number of services under paving of the different classes. That gave us all of the classes. I subtracted that from the total number of services which Mr. Schenck has given here, and that gave me the number of services under pavements. I distributed that over the different kinds of pavements, not by actual count. I then took the information given me by Mr. Schenck as to the number of feet of distribution mains and the different classes of pavement which he had shown from the map. After having that information before me I determined the percentage of mains under the different types of pavement. To illustrate—10 per cent, under asphalt block. Then I applied those percentages to the balance of the services, that is the difference between the total number of services and the number shown in dirt. For instance, if there were 20,000 services under pavement, say, and there was 6 per cent. of the mains in length under a certain kind of pavement, I would put 6 per cent of 20,000 services under the same thing and right straight through, and thus dispose of them in that way. That appears in this sheet here. That is the method I observed. It costs more for the replacement of the different classes of pavement, as you will see in the paving book there. No determination is made upon pavement, it is made [fol. 168] upon the length of main under the pavement, just the same as Mr. Schenck said he did not know the length of the pavement, he did not figure the length of the pavement. Of course he did not. What he determines from that book there is what streets are paved, and then he determines what is the length of main under that street. If all the mains were laid under that asphalt, we would have to do no further determination, we would have known that all the services were under different classes of pavement, so we take the percentage of the mains that were under the different pavements. For instance, if the mains were under two kinds of pavement, asphalt and macadam, just about equal

division, I would put in here figures setting out half our services for each kind.

Mr. Moran: I will now offer Exhibit 3 for Identification, this sheet as well as the other.

[fol. 169] Mr. Moran: I offer in evidence certificate of incorporation of the Kings County Gas and Illuminating Company.

Mr. Hyatt: No objection.

The Master: Received and marked Plaintiff's Exhibit No. 8.

(Marked Plaintiff's Exhibit No. 8.)

Mr. Moran: The certificate of merger of the Kings County Gas and Illuminating Company into and with the Plaintiff.

Mr. Hyatt: No objection.

Mr. Moran: Dated the 30th day of June, 1904.

The Master: Received as Plaintiff's Exhibit No. 9.

(Marked Plaintiff's Exhibit No. 9.)

Mr. Moran: I offer in evidence a contract made between the Town Board of New Utrecht and the Kings County Gas and Illuminating Company, dated the 20th day of December, 1889.

Mr. Hyatt: No objection.

The Master: Received and marked Plaintiff's Exhibit No. 10.

(Marked Plaintiff's Exhibit No. 10.)

[fol. 170] Mr. Moran: I also offer in evidence the agreement made the 19th day of March, 1891, between the Board of Improvement of the Town of New Utrecht and the Kings County Gas and Illuminating Company extending for a period of fifteen years the contract just received in evidence.

The Master: Received and marked Plaintiff's Exhibit No. 11.

(Marked Plaintiff's Exhibit No. 11.)

Mr. Moran: I offer in evidence the agreement made the 26th day of June, 1907 between the Kings County Lighting Company and the City of New York, by the Commissioners

of the Water Supply, Gas and Electricity, modifying the last mentioned contract.

Mr. Hyatt: No objection.

The Master: Received and marked Plaintiff's Exhibit No. 12.

(Marked Plaintiff's Exhibit No. 12.)

Mr. Moran: Now we offer in evidence the deed from Charles C. Burns, unmarried, to Kings County Gas & Illuminating Company, dated the 23rd day of January, 1896, re-
[fol. 171] corded the 24th day of January, 1896, in Section 3, Block 819, Liber 4 of Conveyances, page 294, in the office of the Register of Deeds of the County of Kings.

Mr. Hyatt: No objection, your Honor, providing it is subsequently shown that this property embraced within the description of that deed is used and useful in the making of gas.

Mr. Moran: That deed describes the property where the works are located, between 54th and 55th Street, and New York Bay.

Mr. Hyatt: I presume that will be shown, your Honor.

Mr. Moran: Yes, sir. If it is not used or useful, we will not claim value for it.

The Master: It will be received as Plaintiff's Exhibit No. 13.

(Marked Plaintiff's Exhibit 13.)

Mr. Moran: I offer in evidence the deed, dated the 15th of January, 1896 between Benjamin F. Carver, deceased, and others, to Charles C. Burns, of the City of New York, which deed is recorded in the office of the Register of the County of Kings in Section 3, Block 819, Book 4 of Conveyances, at page 283. That is a deed in the chain of title to Burns, who made the conveyance just received in evidence.

Mr. Hyatt: The position of the defendant Attorney General is the same no objection, providing it is shown the
[fol. 172] property embraced within the description is used and useful in the manufacture of gas.

The Master: Received and marked Plaintiff's Exhibit 14.

(Marked Plaintiff's Exhibit 14.)

Mr. Moran: I also offer in evidence deed dated the 23rd day of January, 1896, between Lefferts L. Bergen and wife and Catharine M. Wyckoff, to Charles C. Burns, recorded in the Register's office of the County of Kings, Section 3, Block 819, Book 4 of Conveyances, page 285, on the 23rd of January, 1896, being a deed of a portion of the premises conveyed by Burns to the company.

Mr. Hyatt: Same position, no objection providing it shown to be used and useful.

The Master: Received as Plaintiff's Exhibit 15.

(Marked Plaintiff's Exhibit 15.)

Mr. Moran: I offer in evidence letters patent from the Commissioners of the Land office to Benjamin Carver, dated the 7th of May, 1880, recorded in the office of the Secretary of State May 10, 1880, also recorded in the Register's office of the County of Kings in Liber 1930 of Conveyances at page 323 on the 10th of May, 1880. The description of these letters patent show that it was a conveyance of land under water in front of the premises that Carver owned at that time.

Mr. Hyatt: Same position, your Honor; no objection provided it is shown the property in question is used and useful in the making of gas.

The Master: Received and marked Plaintiff's Exhibit [fol. 173] 16.

(Marked Plaintiff's Exhibit 16.)

Mr. Moran: Also Letters Patent from the Commissioners of the Land Office to Lefferts L. Bergen, Rebecca L. Bergen and Catharine M. Wyckoff, date the 20th of May, 1869, recorded October 30, 1869 in the office of the Secretary of State, also recorded on the 30th of October, 1869 in the Register's office of Kings County in Book 920 of Conveyances at page 508. That conveys land under water in front of the premises owned by Bergen and others at that time.

Mr. Hyatt: Same position, no objection provided it is shown the property in question is used and useful in the making of gas.

The Master: Received.

(Marked Plaintiff's Exhibit 17.)

Mr. Moran: I offer in evidence an authenticated copy of report of John Newton, Colonel of Engineers, concerning the establishment of pier and bulkhead lines in front of the premises, in which the pier and bulkhead lines of the property has been fixed by legislative act.

Mr. Hyatt: No objection to that providing it is shown the plaintiff complied with the fixation by the War Department in establishing the lines, in building any piers, [fol. 174] wharves or docks, providing it is shown that they complied with the direction of the War Department.

Mr. Ward: I will object to the introduction of this exhibit. This is a report made by some Colonel of Engineers to the Governor, and I do not see what bearing it has, or what bearing it would have on any one.

The Master: Objection overruled. Mark it Plaintiff's Exhibit No. 18.

Mr. Ward: Exception.

(Marked Plaintiff's Exhibit No. 18.)

Mr. Moran: Colonel Newton's report refers to a map, a portion of it, and that map has been traced and is on file in the Dock Department as Map No. 3005. Now, I take it that that map our friends will want brought right here from the Dock Department, and we will serve a subpœna, but I would like to have this one marked for identification.

The Master: It will be received.

(Marked Plaintiff's Exhibit No. 19.)

Mr. Grimes: We offer in evidence a blueprint of map on file in the Topographical Bureau in the City of New York, 219 Montague Street, as Map No. 4391, showing the old highwater line of 54th Street.

Mr. Hyatt: No objection.

Mr. Ward: You state that is a copy?

[fol. 175] Mr. Grimes: Yes, we got that from the Department.

The Master: Received and marked Exhibit No. 20.

(Marked Plaintiff's Exhibit No. 20.)

A portion of the premises described in the deeds already received in evidence, owned by the plaintiff, has been leased by the Morse Dry Dock Company and I would pray

the indulgence of the court and counsel to introduce in evidence the lease dated the 1st day of September, 1917, for a period of ten years from, I think, the 1st day of September 1917.

The Master: It will be received in evidence.

(Marked Plaintiff's Exhibit 21.)

Mr. Moran: After that lease was made the Morse Company wanted a little triangular piece in addition to what was described there, and by three letters, two from Mr. Elsman and one from the Morse Company, the letters of Mr. Elsman dated October 27, 1917, and November 7, 1917 and the letter from the Morse Company dated November 21, 1917, an additional small area in addition to what is there was added to that lease.

[fol. 176] Mr. Hyatt: No objection.

Mr. Moran: I do not carry the details in my mind as to just how much it was, but if we have these in evidence, you will be able to work it out. These letters the parties have acted under since, and I offer them as one exhibit because they constitute a supplemental lease.

Mr. Hyatt: We have access to them at any time?

Mr. Moran: Anything, I again repeat.

(Marked Plaintiff's Exhibit 22.)

Mr. Moran: To facilitate the work of counsel and everybody concerned, we have had this property mapped and shown on a blueprint, distances between streets, area of property retained by the company and also the property [fol. 177] leased, the area of land under water and so forth. I offer that in evidence. The land on which the works are located.

The Master: Any objection?

Mr. Moran: That was prepared by a surveyor, a draftman out there. It checks up with the papers as anyone can see by reading it.

Mr. Hyatt: Who checked it up?

Mr. Moran: Oh my, everybody checked it up. The city surveyor.

Mr. Hyatt: I have no objection to it.

The Master: Without objection it is received and marked Plaintiff's Exhibit 23.

(Marked Plaintiff's Exhibit 23.)

Mr. Moran: I offer in evidence a deed from George E. Barrett and wife to the Kings County Gas & Illuminating Company, dated September 29, 1890, recorded in the Kings County Register's office. This is a deed of the lands where the holder stations are located on 65th Street and Ninth Avenue, recorded in the Register's office of Kings County, Book 2037 of Conveyances, page 113, April 7, 1891.

(Marked Plaintiff's Exhibit 24.)

Mr. Moran: Also a deed from Giles M. Mead and Florence C. Mead, his wife, to Kings County Lighting Company dated March 17, 1906, and recorded in the Register's office of Kings County in Book 3193, page 268 of Conveyances on December 18, 1909.

[fol. 178] Mr. Hyatt: Same position.

(Marked Plaintiff's Exhibit 25.)

Mr. Moran: This deed just received in evidence is additional lands at the holder station on 65th Street and Ninth Avenue.

I offer in evidence deed dated the 21st day of June, 1907, between Frederick H. Nies and Abby Nies, his wife, to the Kings County Lighting Company and recorded in the Register's office of Kings County in Book 3038, page 230, November 1st, 1907, and this is still a further parcel at the holder station.

Mr. Hyatt: Same position.

(Marked Plaintiff's Exhibit 26.)

Mr. Moran: And deed dated the 3rd of August, 1912, between Remsen Johnson and his wife to Kings County Lighting Company, recorded in the Register's office of Kings County in Book 3367 on the 20th of August, 1912. That completes the lands at the holder station, Ninth avenue and 65th Street.

Mr. Hyatt: Same position.

The Master: Same ruling.

(Marked Plaintiff's Exhibit 27.)

Mr. Moran: The land described on these deeds just received in evidence of the holder station, is shown upon a blueprint which I would like to introduce. It is from

a survey and map compiled by Henry W. Woodcock City Surveyor. It shows in while lines the boundaries of the [fol. 179] lands covered by the deeds received in evidence, which is easily ascertainable from the deeds themselves, but I thought it would be better in talking about things if we had it on a map, and I would like to offer this and have it received in evidence.

The Master: Without objection it is received.

Mr. Hyatt: Pardon me, your Honor.

Mr. Moran: Some of the lands shown on here we do not claim as presently used, but the evidence will show which parcel is and which parcel is not. The large parcel we claim is entirely used, the big holders are on that. There is a gore here and there that is not in use by the company, but we claim nothing from the introduction of this map and these deeds except that we own the land. Unless we prove that we are using it in the public service, it should not be allowed.

Mr. Hyatt: No objection, providing it has those characteristics described by Mr. Moran, of counsel.

Mr. Moran: If there is any error in these things, you can correct them.

The Master: Received and marked Plaintiff's Exhibit 28.

(Marked Plaintiff's Exhibit 28.)

The Master: We will adjourn until to-morrow at 12:30 for the purpose of visiting the plant, and the hearing will be resumed in this room on Thursday morning at 11 o'clock.

[fol. 180] Brooklyn, New York, December 20th, 1923.

The Master: I think it might be noted on the record that yesterday was spent by Counsel for all of the parties, together with the Master, in an inspection of the plaintiff's property and plant, and that they were accompanies by Mr. Merrifield, the gas engineer of the Public Service Commission and Mr. Archibald. S. B. Little, gas engineer for the Attorney General, together with the engineer and officers of the plaintiff company.

[fol. 181] ANDREW J. GOSNOUD

Direct:

I am familiar with the monthly statement gotten out by the Company containing some statistics about the number of feet of mains and the number of services and so on in the plant at the end of the month. We get them out monthly. We call them statistical statements, gotten out every month for the year. They are made up as a compilation of the facts and figures which we gether from the several departments coming over to our department. The different departments report daily to the Commercial Department. The sheet which I have produced here, is entitled "Kings County Lighting Company, Distribution Department, Daily Report for the period beginning 8 a. m., May 31st, 1923." That is the daily report from the Distribution Department. Among the things they contain are statistics with reference to the mains, services and meters, any additions during the day, any additions or removals made during the day and the amount on hand at the close of the day. That comes in every day. The department summarizes that for the month. They send in figures for the whole month. This one which you hand me has the number of services at the close of May 31st, 1923, and the number of feet of mains at the close of May 31st, 1923.

Mr. Moran: I will have that marked for identification.

[fol. 182] (Marked Plaintiff's Exhibit No. 29 for identification.)

The carbon copy consisting of half a dozen or more pages entitled "Kings County Lighting Company, comparative Production Statistics, May, 1923," on the first page; another page, "Sale of Appliances May, 1923," and another page under the heading "New Business, Mains Services, Meters, May, 1923," is the monthly statement of statistics. As of that date it is the statistical record with reference to mains and services. It shows how many were added, also how many were removed. It shows the record at the beginning of the period and the close of the period.

Mr. Moran: I will offer that page in evidence. I have no objection to the whole thing going in, but that is the only page we have reference to.

The Master: With that limitation, it will be received.

It shows the statistics as of June 1st, of course, it is dated May 31st, but it shows them on the morning of June 1st, of course.

That is made up under my direction. As this daily report is received each day in the office, the original tickets upon which the work is done, the main tickets, service tickets, meter tickets and other tickets have been filed. The number of tickets is counted of each class; in the case of the mains, the number of feet, and that is checked against [fol. 183] the daily sheet and then an accumulation is made up of this daily sheet for the close of the month. The different departments get out a daily sheet with those statistics on. The company does not get out an accumulated daily sheet. Each department sends in a daily sheet. We get out a report that brings them all together once a month. This is a monthly current report of the company's statistics.

(Received in evidence and marked Plaintiff's Exhibit No. 5—Sheet 7.)

Mr. Moran: May we dispose of Plaintiff's Exhibit No. 3 for identification now?

(Marked Plaintiff's Exhibit No. 3.)

As I recall it, Mr. Schenck testified that the distinction between cast iron and wrought iron and other classes of main was taken directly from the map which is shown as Plaintiff's Exhibit No. 1, and in scaling off the map the other day, when asked about the wrought steel and wrought iron mains of a certain size, he went directly to the map, when he was questioned about it, and got the information from that source. He knew what was there, and in order to refresh his memory he went to the map and checked off that class of mains.

This Exhibit 5, the statistical data, dated May 31, for the month of May, that was prepared for that month in the usual course of business. That paper I bring here is brought from the files of the company. It was not pre-

pared for the purposes of this case. We find one somewhat like that for April, June, July, each month in the year.
[fol. 184] Every customer has on his premises at least one meter. A few have more than one, very few. The only reason would be that if we had a very large installation we would put in two meters to take care of that, two large size meters. That is also a precautionary measure for the consumer in case anything did happen to the meter, he would still get service through the other meter. We do not set the meter until application is made by the consumer, the person who occupies the house. The builder builds the house and then sells the house, and we put our service in when the builder builds the house and then when the application comes for a meter, by the customer who is going to use the gas, and he makes the usual deposit, we set the meter. Meters are of different sizes. They are classified by lights, three light meters, five light meters, and so forth and on up to three hundred light. They run 3, 5, 10, 20, 30, 45, 60, and there are 80's, but we do not use 80's; 60 and then a hundred, 150, and 300. The three light meter is the smallest. It is not installed any more. We do not install them excepting changing the present three lights that we have on our district, usually used for hall lights. If a family did not have an automatic water heater, a five light meter would be the usual size, that is the dominating size. [fol. 185] Five lights would handle the ordinary cooking arrangements and lights. Automatic water heaters according to what size automatic they put on require a ten light to be a twenty light or thirty light and so on up.

We buy our new meters from the American Meter Company. We bought some from other companies, however, during that period that I have been there. We have a certain amount of meters that are in stock. We keep a number in the storeroom or shop. We keep a certain number there all the time to take care of the repairs to meters and changing of meters on the district. We have some there to make new installations. If your meter was taken in to be repaired, we would send one there from the shop, and if Mr. Whitney applied for a new set, we would send one out from the shop. We keep statistical records showing where every meter is. They are classified into sizes by number of lights and numbered besides, numbered numerically

starting with No. 1, that is the Company number, and the manufacturer has a number on them. We have a company number to every meter. The first was No. 1. That No. 1 was a meter that was installed by the old Kings County Gas & Illuminating Company in 1899 or 1890. I have not the last meter installed—that is I have no recollection as to what the number is. The last meter installed is somewhere between 50,000 and 60,000.

[fol. 186] Meters are sometimes taken out of service and discarded. The number is retained; we do not use that number again. That number is never used again. If No. 13 meter has been thrown into the discard, we won't have another meter No. 13 on our service now.

We have a card index system. When it is necessary to purchase meters, the usual requisition for the purchase of meters is made out and sent through to the purchasing agent. That requisition them comes down to the Accounting Department, who will assign the next serial numbers, that is, the serial numbers to be used on the meters to be purchased. The manufacturer is then furnished, together with his order, the numbers that are to appear on the badges of the meters. These badges contain the Kings County Lighting Company's name and the serial numbers. Upon receipt of the new meters by the shop storeroom, the Accounting Department is advised through the usual purchasing record, that is, the yellow copy of the purchase order, indicating that number of meters and meters numbered in accordance with the serial numbers appearing on the purchase order record agrees, and the purchase is then placed on the cards so numbered. These cards are placed in stock record draw-s in numerical order. As a meter is set upon the district, whether it be a new set or a set in exchange for a meter taken off for repair, the original ticket upon which such meter has been set comes over with the daily [fol. 187] report and are then put through our regular records, after being checked against the daily report which comes from the Distribution Department. They go to the meter Record Department where they take the card showing the serial number and date of purchase and that number is shown on the set ticket or changed meter ticket. They then copy on that ticket the date the meter is set and the location, by means of ledger reference. The ticket is then

filed, placed in the file in numerical sequence, showing that the meter is now setting on the district.

Mr. Hyatt: Let him go on, Mr. Moran, and describe what is done when the meter is taken out. I understand that is kept on this ticket.

Mr. Moran: Yes, but let us get cleared up about the setting of the meter.

The first entry is the name of the manufacturer and the size of the meter, and the date purchased, and then the manufacturer's number. It stands with that information on it while the meter is in the stock room. Then the meter is taken out of stock room, we know that because a meter slip comes to our office bearing the number of that meter, which has never been out yet. Then we go and take our card down that bears that number. And we enter upon the card under the word location some figures, and those figures refer to the ledger references. By ledger references [fol. 188] I mean the consumer's ledger. I have a sheet here of the consumer's ledgers. The consumers ledgers are kept in geographical order, one sheet to an account, in order to allow for expansion and contraction in the order of the sheets. Each block bounded by streets in the territory has been codified, together with the houses built there, and then is codified as new houses are constructed or old houses replaced. This codification was done in this manner. The territory of the company was divided into six districts. These districts were not evenly divided, that is, the territory was not evenly divided, but these sections were marked off for purposes of showing the growth of the business and for collection purposes. The districts were numbered one to six. Each block in the district was numbered consecutively, that is one up to the last number of the block appearing in that particular district. Each side of the block was numbered 1, 2, 3, and 4, and then the number appearing on the house was placed next to the number of the side of the street. After this the numbers were assigned to the meters in the house, that is, if there were nine meters in the house, the meters were numbered 1 to 9. Meters are removed on either removal tickets or changed meter tickets. When these tickets arrive at the office, the number of the removed [fol. 189] meter is shown on the ticket and the man incharge of this card record would remove the cards from the active

file, that is the card showing that meter number. He would indicate on that card the index of the meter, the date it was removed, and the test of the meter, that is the test of the accuracy of the meter. He would then place that card in the stock file and it would remain there until the meter was again set on the district. We would have another ticket when that meter is set up again. On this card which I hold, and which bears the company's serial number 1830, there would appear here notations from time to time when the meter is set and removed and re-set and removed, and so on and so forth, so that by looking at that card you could tell the whole history of the meter, only from the date that meter card started. Prior to that we kept a book, and, when we transferred the information from that book to the cards, we did not go back and put on all the times the meters were removed and set. This is commonly known as the meter life record, and of course it gives the meter life record of the meter. When a meter is condemned, that is, when it is of no further service to the company, the shop advises us to that effect and the card then is removed from the file—it would be in the live file or the stock file—and the date when it was condemned is placed on the card file, and that [fol. 190] is placed in another drawer, so that we have a drawer containing all the meters that have been condemned, with the numbers on them. The complete card record then contains a record of all the meters that were purchased by the company, even those that have been condemned. When a meter is destroyed or condemned, the number is never used again, but that numbered card is placed in the card file, showing that the meter had been condemned, and it holds that number as a condemned meter in our books. It is put in another file called the condemned meter file. At the close of each month a physical inventory is taken of the meters in stock. A list is made up of the numbers of the meters, showing the company's number and the manufacturing number and the size of the meters. This inventory is sent to the office and is checked against the cards shown in the stock file, so as to insure the accuracy of the files—a check of the meters in stock. Now, for the checking of the meters on the district, the ticket when received, after having passed through the Meter Record Department, is sent to the addressograph department. The addressograph department make up a plate, an addressograph plate, show-

ing the number of the meter, the name of the consumer, address and the ledger reference. I have gotten a lit ahead of my story there because I have not indicated system whereby we would catch any tickets that may beco lost, strayed or stolen.

[fol. 191] All tickets of the company, as the applicatio are made by the consumers, before the ticket is execute lists are made up by the stenographic bureau. One list retained by the office and the other set is sent to the partment who are to execute the tickets. As tickets are cuted they are turned to the office and the executed tick are checked against the list retained by the office, so as insure the execution of every ticket issued by the office.

The total number set on the district is carried right al from day to day and from month to month and distribu among the different light sizes all the time. Now, tha the one on May 31st (indicating). That shows the met in service, according to light number, installed during months of May, removed during May and in service at end of the month. That is the daily and monthly sum nation of our meters in service. This daily report shows meters in stock. We do not show that on our statistical record. We have it also on our Public Commission Service report. We report once a year to the Publice Service Comm sion, and we show on there the number of meters in serv at the end of the accounting period, December 31st, 1922, us say, or whatever it was. We also show the number meters in stock on that day. We took a physical invento of the meters in stock once a month. Sometimes there an error in the number of the number of the meter. W they put the number of the meter down and check it [fol. 192] sometimes they make an error in the number the meter, but that is corrected. We take our records a go back to the original paper for that. Every month th is an actual check, an actual count, against an inventory the meters in stock. That is, the meters in stock. There a progressive count of the meters on the district. That to say, meters are read from the first day of the month the 26th day of the month. Of course, that is only duri working days not on Sundays or holidays. The met readers make an actual count of all the meters they re when they go out on a trip. That is from this meter reco

book. After they have taken the readings, they actually count the number of meters they read, and we have reports showing the number of meters read and those that have been skipped—that is, where they could not get into the premises or for some other reason could not take a reading of the meter.

The addressograph department addressograph the blank bills to be made up. They also count the number that they have addressographed. The billing clerks who make out the bills make a count of the number of bills that they make out, which of course must agree with the addressograph, and it is checked to agree with the meter reading book. I say "checked to agree" with it, because in the course of [fol. 193] business some tickets that have arrived at the addressograph department, have not arrived at the meter department. That is to say, the meter book may be cut on the day that the ticket- are received at the addressograph department, and we then take into account the number of tickets that were out at that time, to see that that agrees. This, then, indicates that we have had a reading on every meter or every meter has been accounted for that appears in this meter record book. By this count made by meter readers, we are able to verify our records. We verify it progressively. We do not have a total at the close of the month, we could not possibly get a total at the close of the month to agree with that total shown on there, because it is done progressively. We have on this Plaintiff's Exhibit No. 5 here, that part of it which was not received in evidence, relative to meters, it shows the number of meters in service. That shows the number of meters in service on June 1, 1923, for different light sizes.

Mr. Moran: I would ask that that portion of Plaintiff's Exhibit No. 5 be received in evidence now."

I compiled this statement or had it compiled under my direct superivsion.

The Master: I will receive it. The whole of Sheet 7 will be received.

[fol. 194] The Master: It is received without objection.

(Marked Plaintiff's Exhibit 29.)

I have prepared for this case an exhibit showing the number of meters on June 1st, 1923 in stock and in service. It

shows 50,717 meters in service. That is the same total number as shown on the exhibit just received. There is a little difference in the classification. It agrees with the report received from the shop. It does not agree exactly with the monthly report for some reason or other. It shows 1,917 of three light meters. The monthly report shows 1,925. They are both supposed to have been checked actually with the ticket, but this paper I have before me is the final tickets submitted to me of the meter record department showing the total number of meters on the district of the different sizes as of that date and the total number of meters in stock of the different sizes on that date. That is from the records as they are permanently kept now. The number of meters purchased, the three lights, if we take the total number of meters purchased since the company started, the three lights, and subtract from that total the number of three lights that appear in the condemned file, that would give us the number of three lights that are on the district and in stock; then if we subtract the number in stock from [fol. 195] the number we had at that time, it would indicate the number on the district. In five light meters, the monthly report indicates 45,124. This statement I have before me is 45,131, a difference of seven meters, and that other was a difference of eight meters. On the twenty lights 1,489 appear on the report and 1,490 appear on the monthly report. There is a difference in the thirty light size there of two. But they all balance.

Each meter requires two caps and two swivels. They are to connect the meter to the pipes. The cap is this shape (exhibiting cap), and put at the outlet and the inlet side of the meter, and this so-called swivel is placed inside the cap and makes the permanent connection with the house riser on the one side and the pipe going up from the service on the other side. There are two on every meter except on the 300-light meters, and they are connected without a cap and swivel. It is a larger sized meter.

Mr. Moran: I will offer that statement in evidence.

The Master: I will receive this in evidence.

Mr. Ward: Exception.

(Marked Plaintiff's Exhibit No. 30.)

I have produced a sheet now which is entitled "Reproduction cost of meters on district as of June 1st, 1923, and reproduction cost of meters in storeroom as of June 1st, [fol. 196] 1923."

Mr. Moran: I would like to have that marked for identification.

(Marked Plaintiff's Exhibit No. 31 for identification.)

So far as this lists meters, total number and sizes, it is in agreement with the last list received, Exhibit No. 30. On this I have attempted to put down a price for the meters, for the different classes and different styles and the total. I do not purchase the meters of the company. Mr. Brownell does that. He is purchasing agent. Meters are purchased by requisition made up by the Distribution Department, the department requiring meters. That is a requisition, which is an order or a statement from the Distribution Department that a certain number of meters of different sizes, is needed. That is made to the purchasing agent. It goes to the purchasing agent, first, of course, and he obtains prices on it; then he sends it down to the general manager, the president and general manager, for approval, approving the purchase of the meters. In the case of meters, it is sent to the Meter Department to get the numbers required, the necessary numbers required, the serial numbers. Then when prices are obtained, it is submitted to the president—the president or general manager. That is Mr. Elsman. [fol. 197] Or in case of his absence, the vice-president. It is approved then, or disapproved, as the case may be, and then is sent back to the purchasing department. The purchasing department on that requisition makes up the purchase order for manufacture. As an auditor of the Company I do not have anything to do with it yet. This requisition then comes down with the purchase order with the yellow copy, so I see there is an authorization for the purchase of that material. Then the yellow copy contains the original requisition number on it besides its order number. That is, the purchase order carries those numbers, and then we wait for the goods to be received. The yellow copy of the purchase order has gone over to the shop, or wherever the goods are to be received, and they receipt that copy to show that the goods are received, and then that copy

comes back. That copy contains the number of meters to be purchased, the amount paid for them, and when invoice comes in we check that invoice against the yellow copy. This yellow copy that we have receipted comes back. That is receipted by the receiving department and indicates that they have been received in good order. Then we check that against the invoice. The invoice is passed and paid. We audit the whole purchase. Payment is made by the treasurer's department, but is countersigned by me. I audit the voucher and I countersign practically every check that is sent out. In this way I have observed the prices paid for [fol. 198] meters. Since I have been there, those prices have changed. We have paid various prices for five light meters in that period. We are not buying any more three light meters, not at the present time, and we have not for some years. But the other sizes, we buy more or less of them right along, excepting the very large sizes, the 300, 200 and 150. We have one 300 and that is in service, and then we have two 200 light meters in service and one 100 light meter in stock. I have looked over my vouchers to see what we paid for meters around in May and June of this year. I know what prices we paid for five light meters and for ten and twenty light meters. We haven't purchased any ten light meters recently, that is, around June 1st we had not purchased any ten light meters. There are 311 of these 10 light meters in the district; we bought some and thirty light meters. I called up the American Meter Company and asked them for the prices of the different sized meters as of June 1st, and they gave me those prices over the phone. Later on, I asked them to write me a letter quoting me the prices of the different sizes of meters as of June 1st. That is, they gave me the price at which they would have supplied any of those meters on that day. They already had supplied some meters, and I have here some of the vouchers that I have examined. On May 17, 1923 the American Meter Company billed us for [fol. 199] ten 30 light meters $30.80 per meter. We actually received those meters and paid for them. I have the papers from over our files showing the payment for those meters audited by me. On the same day, May 17th, we purchased 200 five light meters at $8.40 per meter. On May 24th purchased 19 twenty light meters at $21.00 per

meter. On May 24th purchased ten 30 light meters at $30.80 per meter. On June 2nd we purchased fifty 20 light meters at $21.00 per meter. We did not purchase any three light meters or any ten light meters, that is, at that time. I don't recall the purchase of any ten light meters since that time. They are used where just that amount of gas is to be used, that is all. Each size meter passes so many cubic feet of gas per hour—As to 45 light meters, we don't seem to have bought any 45's right now. I have got the quotations furnished me by the American Meter Company (producing paper). This is it. Five light meters are quoted at $8.40. That is the same price we paid for them. We pa*di* that for them in May, 1923. 20 light meters are quoted at $21.00. That is the same price we paid for them. And for the 30 light meters, the price quoted is $30.80. That also is the same price we paid for them. These prices were quoted to me: For three light meters the price is $7.70, and for 10 light meters $11.20, and for 45 light meters $47.60, and for 60 light meters $61.60, and for 100 light meters $105.00, and for 150 light meters $161.00, for 250 light meters, $224.00, and for 300 light meters $332.50. [fol. 200] That is the net price. It is a discount of certain percentage price. It does state here what the discount is. It is thirty per cent, thirty per cent all the way through.

I now have on this exhibit No. 31 for identification computed the total cost of our meters at the prices we paid and as quoted by the American Meter Company.

Besides buying the meter, I buy the caps and swivels that I gave an inventory of this morning. Mr. Brownell attends to that. I audit the accounts and bills. I have listed on Exhibit No. 31 the cost of caps and swivels per meter. Those figures were obtained from the American Meter Company. They have not been confirmed by letter, just over the phone. I am buying these every day. And those prices I put down there are the prices I paid in the market for them and were around June 1st. And I listed so much for each meter, according to the different sizes. We incurred an expense in handling our meters. When meters are received at the storeroom, of course the meters are unloaded from the truck and placed in the storeroom in order, and of course they are handled in and out of the storeroom, both ways, and a list of the meters received had got to be made up

and then checked and inventories taken every month. The [fol. 201] seller delivers the meters at the shop. We don't have to go to the depot for them. The price quoted there that I have read, includes delivery at our shop. We have our usual storeroom expense for storing them—that is for the handling them and stacking them up in the storeroom and keeping them in order there and handling them when they go out again, and moving them out to the platform. That just goes into the cost of the storeroom, and then that cost is distributed among the different accounts. We have never distributed it to the meters. It goes to the other account, if there is any other account handled, but we have never applied that cost to the handling of the meters. Part of it is charged to labor and part to capital. The meters when received, are not charged into stores, they are charged directly into capital. We do not burden the meters with the storeroom expense. They are charged right way. They are taken right out—even though not used. They are different from material such as cast iron pipe. Cast iron pipe does not get into capital until it is actually put in the ground. But the meter is charged to capital, whether it is in stock or in the district, it makes no difference. But that does not include anything for handling charge. The handling charge goes in among the other accounts. That is to say the cost of the storeroom is put [fol. 202] into the suspense account and then that is allocated to the accounts represented by the stores taken out that month. The stores taken out are indicated on storeroom slips the amount of stores taken out during the month. We take and apply to those storeroom slips a percentage for storeroom expense. This percentage is fixed at five per cent., and, from time to time, we to take the amount of money that is left in the stores account and the amount of money that is in the storeroom suspense account and we find out what percentage the amount in the storeroom suspense account bears to the amount in the stores account. If it is approximately five per cent., we continue that five per cent., but if we find we are going over or under, we either lower or raise the amount of stores—as of June 1st we were using five per cent. I have made an effort to determine just what that store expense is, and get it as near as possible. That is my experience, five per cent, to cover

the handling in and out of the stores, and the storage while in there—it covers everything. And the expense that the company is put to from the time the material man delivers the thing at the storehouse until you send it out to be used [fol. 203] is included in it also. The five light meter and the caps would cost $7.88, and the handling charges at five per cent would be 39 cents. From my experience I would state that five per cent was a fair amount to be added to the cost of the meter, to represent what the meter actually cost you when it is on the platform to go out on to service. Since January 1, 1919, we have been carrying the account called storeroom suspense and we have been from time to time checking up that amount with the amount of money carried in stores account and materials and supplies accounts. We have used almost invariably that five per cent. I mean we have expended in the storeroom expense on an average five per cent of the average daily balances charged to the storerooms for materials in the stores. But that storeroom expense does not accumulate from year to year until it gets up into the millions. Because every time that we install some mains or services whatever has come out of the store*w*, we charge that up to the construction work—a portion of this suspense. But we do not charge up any portion to the meter account when we set meters. That portion of it would go into the other accounts. The reason for that is that we do not put the meter into the storeroom account. It does not go into the material and supply account, and that is the reason we do not do it.

On this sheet I have set forth the price of the meter, the cost of the cap and swivel for the meter, and the handling [fol. 204] charge per meter, of five per cent. basis that I have mentioned, and the total cost per meter, including the cost of the meter and the cost of the accessory and the handling. I have given the costs of all the meters of a given size. Then I gave a summation of all of them, both in stock and on the service.

Mr. Moran: I will offer that in evidence.

Mr. Hyatt: You are thoroughly well satisfied with that, representing the reproduction cost to you of the meters that you had as of June 1st.

Mr. Moran: To meet objections of defendants, I will continue,

We do not get a better price for an order of a hundred meters than if we order five. It is the same price no matter what our orders are, and we have had some large orders to given. We have ordered a couple of hundred at a time. I mean in the last three or four years. We find that it does not make any difference whether we order five or five thousand, the price is the same. We do not ever try to buy 50,000 meters *a*r a time. As to these meters that we actually bought, I followed the system that I described in buying meters generally; that is, first the requisition, then the approval, the order and receipt, the check and then the [fol. 205] bill audited and paid—The cost of the meters did not go into storeroom account at all. If the cost of the meters did go into storeroom account *if* would not have altered the percentage basis of handling. It would not change the five per cent. The fraction of a per cent. of change there would not cause us to change the five per cent. This does not mean that we have handled these 50,000-odd meters in one month or one particular year; the proportion of the number of meters handled in the year would not affect the percentage. That five per cent cost of handling was based upon the value of these other supplies in the storeroom account. The cost of handling those averaged five per cent. As to Plaintiff's Exhibit No. 41, it shows there that we have had on June 1st, 1923, about $22,000 of meters in stock at the prices then prevailing, about $22,000. The total is $24,943, but that has five per cent. added to it. If they were included in our storeroom account we would have $22,000 more than there was in our storeroom account. The total amount that this five per cent. is figured on varies. I am not in a position to state how much it is. It runs around $300,000. It is an average of $300,000 and five per cent. of that would [fol. 206] be $15,000. It does not necessarily follow that it would be that much a year. It is according to the variance in the materials handled. And if instead of $300,000 you made that $320,000, $15,000 would be only a little over four per cent. of the total. There would be a fraction of a per cent difference there. I say there would be a fraction of a percent there. Our storeroom may be now, if we figure it out, 5-¾ per cent. today. And it may be less than five—slightly less. But the average appears to be five per cent, and that is the amount we use. In arriving at these figures

under the total handling charges I took into consideration in the reproduction of our plant new that we would handle something over 50,000 meters in a comparatively short time. At least, I gave some consideration to that; but the only thing that I could arrive at was that it would cost us a good deal more, that it might cost us more than five per cent. That is the only side of it that I could see. It would be more costly to handle that number of meters in a short time than it would over a stretch of years. In handling them you take the meters off, and they are handled very carefully, of course, from the trucks; and when they are put in there, they have to be put in some sort of sequence as to numbers and they have to be put in there and taken out on the district and the numbers taken off and a record [fol. 207] made of them. In handling meters in that particular class of handling, if you have a great number in a small space of time, the cost I would have to make higher if I was estimating it. If we were handling that many meters we would use this same percentage. This estimate is based upon the handling of a few meters at a time. We could not get up a better system of it. I do not know of any other system of handling the meters in any great amount. I would say it costs sixty times as much to handle a 300 light meter as to handle a three light meter. A 300 light meter is very much larger. You have to be very careful with it, of course. A three light meter is just a small meter and you see the capacity in the meter—the size of the meter shows the capacity of it. It is the diaphragm inside the meter that opens and closes. I think I should average the five per cent as the figure that is just about right. I should think it would be a fair figure in either class of meters. I have not made any trial or any experiment to see. That is only my own personal opinion. This 5 per cent is arrived at by me as my experience in the last four years—as being the ratio of expense for maintaining our storehouse to the value of the goods stored therein. And throughout that period of four years it has maintained an average of five per cent; and that is all that this means in this fifth column, total handling charges per meter. These computations were made under my supervision. I am sure they are cor- [fol. 208] rect. These would be my answers if I were asked

separately about each item appearing on this sheet—what is indicated and set down there with respect to each item.

The Master: The exhibit will be received in evidence.
Mr. Ward: Exception.

(Plaintiff's Exhibit No. 31 for identification now received in evidence.)

[fol. 209] Brooklyn, New York, January 22nd, 1924.

ANDREW J. CONNOUD

Direct:

We put in a statement showing the number of meters on the district and the number in stock on June 1st, or May 31st, 1923. And I produced at that time, in support of that statement, a monthly statement and a statement from the Distribution Department. There was a discrepancy, a discrepancy between the monthly statement and the exhibit. I have made a further examination in respect to that matter. I produce the record from which the exhibit was made up. That is the meter lives—the meter life summary. That is made up monthly. This is a meter life summary for the month of May, which shows the condition of the meters as of May 31st. That shows the meters as they appeared on our Exhibit No. 30. In fact, it is the statement from which Exhibit No. 30 is taken.

Mr. Moran: I will offer it in evidence."

This is prepared in the regular course of the business every month and comes to the attention of the officers and employees of the company, as to the condition of the meters at the end of each month. And the one produced here is [fol. 210] the one that was made up in the ordinary course of business for the month of May, 1923. It was not prepared for this case, and was not prepared for use in this litigation. And the papers I produce here are typewritten copies of the ones in your files, and they are copied on these same sheets in our regular files. The purchases to April 30th, 1923 means the number of meters purchased by the company since its inception. 53,119 is our highest meter

number in our serial. It was as of April 30th. We then show the number of purchases during May, in this case being 571, and then we show the number purchased to date; that is, May 31st, which shows 53,690. That is the highest badge number. Then we show on the next line the number of meters that have been condemned prior to May 1st and during May—condemned and lost. Condemned meters are meters that are of no further use. They are retired for that reason. They are scrapped, but "condemned" and "Lost" come in together there, because in many instances we lose meters by fire, fire in a residence, and the meter is destroyed. Then, we put that in what we call our condemned meters, the same as we do when they are of no further use to us; and this line shows the total number of condemned and lost meters down to date. There are 462 condemned and lost in that time, and then we subtract that from the total number purchased, and that gives us the net available [fol. 211] meters, which is 53,228. The top line of the column indicates the size of meters by lights—3-light, 5-light, 10-light, and so forth. Now, after arriving at the amount that is available, we have on the next line the number of meters in stock of the various sizes, and, subtracting from the net available gives us the number of meters on the district.

The Master: It will be received in evidence and marked Plaintiff's Exhibit No. 32.

(Marked Plaintiff's Exhibit No. 32 in evidence.)

Prior to May 1, 1921, the company laid the service and stood the expense clear in to the meter, practically. It did the header work and piping in to the meter and to the riser. And it changed that practice on—on May 1, 1921. In giving length of services I have already given, I have given the length of services clear in—all such services laid prior to May 1st, 1921, and only the length to the lot line of services laid after that. I have a record of the number of meters or services that were on the district at the time when that change was made. This is not needed to support any of the calculations I have already made. In other words, this change of practice on May 1, 1921 not only resulted in our laying a shorter service to the customer, but it also resulted in his having to put in some piping in the

house that we previously put in. And the only way we [fol. 212] can find out about how much that amounts to, that piping inside, is to find out how many meters there were on the district at the time of the change, that is how many meters set. I have a list of that. The meter life summary would show that. But the only figures that will show that on this report are opposite the line marked "On district," showing the number of meters on the district. The number of meters on the stock will not affect the installations. I want to make that plain. It is the meters on the district, of course. The meters on the district, because that shows the number of meter installations as of that date. I have the meter life summary before me.

The Master: It will be received in evidence and marked Plaintiff's Exhibit No. 33.

(Marked Plaintiff's Exhibit No. 33.)

[fol. 213] HENRY R. BURT

Direct:

I live in Bronxville, New York and my business is general contractor and engineer. I am an officer of a corporation known as the Northeastern Construction Company, doing business at 101 Park Avenue. The general line of business carried on by that company is engineering and contracting business of a rather large variety. We construct almost every type of building, building engineering structures such as bridges, warehouses, office buildings, factory buildings, piers, pier sheds, almost every class of construction work. My function in the company is not very well defined. I do almost all the departments of the work. I estimate, get new business, run work, see that the bills are collected on the work that I run, and engage actively in every department of our company. The president of the company is E. A. Garber. I am first vice-president. I was one of the organizers of the company in 1904 and have been with it ever since. I am a builder or engineer by profession. Before I went with this company I was one of the engineers on the Maintenance of Way Department of the Pennsylvania Railroad for about a year, and I was for approximately

a year with the Perth Amboy Terracotta Company as an estimator. I took a course in civil engineering at Columbia University. I was in the building business before my con-
[fol. 214] nection with this company, only as far as the Terra Cotta Company was in the business of building material. I have been with this company pretty nearly 20 years. Next May it will be 20 years. I have purchased material, employed labor, in the construction of a great many buildings in that period—during that time about 18 or 19 million dollars' worth of work. And the senior activity has been practically in New York, with the exception of the last three years, when we opened offices in Baltimore and Charlotte, North Carolina. I have done work in Brooklyn .I built the public baths at Coney Island. I have done work at the Bush Terminal. I have built a garage on Pacific Street. In fact, our yard was under the Brooklyn Bridge at one time, where we did repair work incidental to our plant; and I built a residence; and I have done, of course, considerable work in Long Island City and Astoria. We are now doing about three million dollars' worth of work at the present time. We are doing the Veterans Hospital at Beacon, New York, about a $1,500,000 job. Our company has the contract for that. We are building in Baltimore about six or seven hundred thousand dollars' worth of work, and in and about Charlotte, Columbia, and three or four contracts in the South; Federal Land Bank at Columbia, and Reynolds Memorial at Winston-Salem.

[fol. 215] We have made an inventory of the buildings of the Kings County Lighting Company. I was engaged on it practically during the summer up to December 1st. I had done considerable work of that kind before. At the time of the litigation in connection with the dollar rate four years ago, 1919, we appraised the properties of the several gas companies of New York, the Bronx and the Brooklyn Union Gas Company. In the 80-cent litigation four years ago, I did not testify at that time in the Federal Courts, but in the State Courts before a referee. I have inventoried some properties and buildings of the gas companies in Manhattan and the Bronx. We are engaged in making inventories of the properties as to the buildings and appurtenance-, of great many of the companies at the present time in this dollar rate litigation, to determine the cost to reproduce them.

All this litigation is as of June 1st, 1923. I testified in the case pending before Special Master Graham, brought by the New York and Queens Gas Company and the Bronx Company, those two cases. I am engaged on other properties. I have made an inventory of the Kings County Lighting Company's building, in order to ascertain the quantities of material in them and the amount of labor necessary to build them and the condition of the buildings. I went at it in exactly the same way I would if I were going to build a build-
[fol. 216] ing, going to make a bid to build them. The appraisal was made up exactly the same as an estimate sheet that we would make in bidding on a contract. I included the buildings at 54th Street and 55th Street there on New York Bay, at the works, and the buildings at Ninth Avenue and 56th Street. I did not include the gas holders. I just took the part that would naturally be done by me as a building contractor. I saw the buildings last on December 1st. I saw them twice during the summer. All the work, the information from which this appraisal was made, was taken off in the field. Our measurements were made in the field. We had certain plans, but they were not used for the production of this inventory. I have put the results of my work in a volume.

(Paper produced by witness.)

Mr. Moran: I ask to have marked for identification the papers produced by Mr. Burt.

(Marked Plaintiff's Exhibit No. 3 for identification.)

On the first inside sheet I have a general summary of the costs of structures and appurtenances as of June 1st, 1923, in which I enumerate the reproduction value of the 55th Street Station, and also below it the 65th Street Station, showing a grand total of $752,138.51. On the following page I have the 55th Street Station, a summary of the various buildings on that station, with the value in the second column placed opposite each building showing a
[fol. 217] grand total of $658,831.69. On the pages following we have the names of the various buildings and the detail of the quantities as they occur in the buildings and that is true of the following sheets. The principal building down there at the works is the office and Meter building.

That is the first building mentioned. That is the name of the building, Office and Meter Building. The other more important buildings that are there are Exhauster House, and two purifier houses—the old one and the new one, and the generator houses. Those are the principal types of buildings shown on the list. I have a list of some eighteen or twenty. They are not all buildings. There are ash pits and bins, coal pockets, trestles, coal hoisters, and pipes, bridges, elevator pit, and so on. Those are the principal buildings composing the plant. There is exhauster house and tank and general storage building. I have separated below the paving and retaining walls and the pier and the sewer. That sheet is called a general summary of the structures at the 55th Street Station. On this summary sheet are pages 1 to 2, for instance, after office and meter building. On 1 and 2 we will find the details of that one building, both these sheets. I have excavation—five feet deep; quantity 227 unit cubic yards; unit price one dollar; total $227. That is the amount of dirt that you would [fol. 218] have to remove in order to build that building in its present location and elevation. The "one dollar" per cubic yard is the cost to take out this dirt from the hole. That is the unit price. This item of excavation will appear with most of the buildings. Practically all of them have some excavation, that means digging the cellars or the foundation for the walls if there is no cellar. Any earth necessary to be removed, in order to place the building down in its present location. The dollar unit price here will run uniformly on that. Back fill is the amount of earth that you would put back after constructing the foundation walls of the building. In other words, that is the amount of earth that you have to take out and put back in order to have room enough to build the foundation walls. And the sum of what you haul away, which is the third item mentioned, "haul" and the back fill is equivalent to the total excavation, 227 yards in this instance. In the buildings down there there is mostly brick. Generally brick would be the biggest item. Brick work walls—we have used there 238.52 brick. We do it in decimals of thousands of brick, because our unit prices refer to thousand brick. It is a simplification. We just put a decimal point after the thousand and use 52, which really represents 520. And that is the number of

[fol. 219] brick in the walls. That is obtained, of course by taking the cubic contents of the walls, deducting all the openings, taking 21 total bricks to the cubic foot, and that gives you the total amount of brick in the building. The unit price of $49.55 is the cost of the brick plus the mortar, p-us the labor to put it in the wall, and $49.55 multiplied by the 238,000 equals $11,818.67. $49.55 is the cost of brick in the place. The brick cost per thousand is not here. The first item is the brick. The price, the standard price delivered alongside, was $19. Hauling would be $2.50 per thousand. The dealer's profit would be 10 per cent or $2.18, so that the total cost of that brick up to the time it is dumped on the property is $23.65. All the newspapers at the time would say the same thing. Any trade paper would give you the same price. That was the universal price of brick, no question about it, and everybody knew it in the building business. The cost of mortar per thousand brick in place was $4.94, and that is produced by—it is rather an intricate calculation. You take the cement and the sand and the necessary lime to produce a cubic yard, and you get the price of a cubic yard of mortar mixed, and reducing that for a quarter inch joint, we have the cost and that corresponds to the cost of mortar per cubic yard of $11.36—that is the amount of that, or a little less than half a cubic yard. That is the amount of mortar used today on [fol. 220] one thousand brick. That is material. That is the material used, and you take a bricklayer at $10 for an eight hour day. We did not use any bonus that was being paid at that time, because we believed in using the union rate, very few bricklayers being hired at $10 a day during that particular time. That was the union rate for bricklayers, at ten dollars per day without bonus. And the helper at seven dollars per day, which was the rate, and a bricklayer, with two-thirds of a helper, in other words three helpers serving two bricklayers, at a total salary per day of $14.67 in an eight hour day, and we have assumed that a bricklayer would lay 700 brick, which gives us the cost of the salaries of the bricklayer and the portion of the helper as $20.96 for every thousand brick laid, and we added to that $28.69 which gives a total of $49.55 as the unit price used in the valuation. That is the customary way to analyze the unit price of brick work, that is our customary

way, and it is quite usual in the trade. It is about $50 a thousand. In actual practice we have to work it out in the same way. The condition of labor and the prices of sand vary more than anything else. On one day the price of sand would be quite different from the price of sand on another day. Of course you could say $50 or $45, but when you get to multiplying any such large amount as this; sometimes a million brick or two or three million brick when [fol. 221] you are multiplying in such large amounts, it might make a very cumulative error. This is an estimate which is a scientific guess, and you try to make that as near the conditions as possible. The cost of bricklayers' time does not vary around New York. They work an eight hour day. They are paid so much an hour. Non-union brick layers might lay them by piece work, to see how much they can throw up in a day. The union boys work for eight hours. Sometimes they don't lay but 200 a day. We have other buildings besides this office and heater building in which there are brick. The brick is all the same price in all buildings, $49.55 in place. We don't put labor down separately at all. That is included in the unit price to put the material in place in the building. The office and meter building has a slate roof. The prices I gave there are for the slate in place. "A square" means 100 square feet, 10 by 10. Slate and roofing is generally bought by the square. That would be 2150 square feet, at $23 a square. There is some steel structure to support this roof. That is under "structural steel," which is about the tenth item. On the first page is structural steel, showing 10,338 pounds at 6.23 per pound. That is erected, that is in place. Our company very often erects steel. We do not do it 100 per cent [fol. 222] of the time, but we very often erect steel. That unit price was the price for Brooklyn—and New York, as a matter of fact. We buy it fabricated from the American Bridge Company, or something of that sort, and have it put on the job and erect it ourselves. In this case we have got roof trusses which are connected with the risers, but the chances are that we would erect it ourselves. Carpenters do all the work in connection with anything where wood is involved, framing lumber and setting your doors and setting the window frames and the flooring, and their time is included in *in* the different classes of the work that

I have enumerated. Framing lumber means yellow pine, $99.05 per thousand feet of board measure and that includes the lumber and the time of framing it, putting it in. Material and labor for this building amount to $35,006.47. That includes the contractor's profit. Field overhead is the cost of shanties, superintendents, timekeepers, watchmen, telephone, liability insurance—in other words, all the miscellaneous items that a contractor would spend in order to construct these buildings. That is arrived at by making a detailed cost of the superintendent's salary and the as- [fol. 223] sistant superintendent's salary and the timekeeper, tabulating those and taking the total sum of that as against the total cost of these structures and foundations, and the percentage is 6.58 per cent. That 6.58 per cent runs uniformly through all the buildings. In figuring out what our cost would be, I have considered all the buildings being built at one time, in a group. This net cost would be 6.58. That conforms with my experience in other work that I have actually constructed. In my actual building operations, I figure out an overhead for every contract that I bid on, and the percentage concurs very much with this. This concurs for the same size of a contract. The average overhead we find runs between 6 and 7 per cent or thereabouts. On contracts that are smaller than this, the percentage of overhead is much higher, as of June 1st, 1923. I know what it was 20 years ago, but I do not know when these buildings and structures were erected. The smaller the contract is, the larger will be the overhead in percentage; if this was for a million and a half or two million job, the percentage of overhead might be much lower. I did not mention the rental of plant and necessary transportation of same, such as light for protection at night and pumping if necessary. Telephone I did mention, and such miscellaneous items as cleaning up, cleaning glass-incidental items that you would be up against in protecting building material on the work. [fol. 224] If you lower the cost of the buildings, the percentage of overhead would be higher. "Contractor's profit, 10 per cent." That is the usual contractor's profit that we use, and that I know to be prevalent in the trade. 10 per cent, is the usual contractor's profit. I have taken up the other buildings through here in the same way. As to the

limit of accuracy, we go down to the nearest inch; that is the usual practice. I had a gang of engineers measure the building and measured them up. I had this inventory with party in charge of a man by the samme of Mr. Mazeau, and I told him to go out and measure off these quantities. During that time I visited the plants twice. I did not take any measurement at that time. On December 1st, I made a final check-up with Mr. Mazeau, where I walked around to every building and measured them. I had this inventory with me and I checked up the various items as they occurred in each building. As to the office and meter house, I ran the distance on it, how long and how wide it is and how high, and I did the same with others. The thickness of walls, the height of floor space that is, the hieght between the ceiling and the floor, the dimensions of the openings. I went through every building in this plant. I examined the foundations of each plant, of each building. My field men measured them. I have the dimensions; my working papers [fol. 225] here in the Courtroom. As to the kind of foundation, I am satisfied on that. Taking the quantities of material in roofs and all tha- sort of thing, it is a very simple matter after you have the dimensions of the buildings, to tell exactly how many squares of roofing material are in the roofs. I have not taken anything in here in the way of fixtures at all, nor machinery. I have taken the pier or portion of the pier. My inventory will show that. Take the pier at the foot of 54th Street. On page 51 we will find the piles that were used there, the braces and all the other things that went into that. I checked all that up. I was on this pier. I have given also the buildings up at the 65th Street Station, on the next page, after page 52, showing five items of buildings. They are office and shops, boiler-house, engine-house, booster-house, pipe shed. The office and shop is a very nice looking building. It is a yellow brick, one-story buildings, quite large in ground dimensions and it is in very good condition. I was at the 65th Street Station three times. I am speaking of the office and shop. We have common brick work there, 184,950. I have the same price, $49.55 there. I also have face brick; that is 55,000 at $80.18. That is another matter, that face brick. The difference in price is about $30 a thousand, and some of

that difference is due to the difference in the price of the brick, while some of it is due to it costing a little more to [fol. 226] lay. In ten hours these men would lay 700 of the common brick. They would not lay quite as many face brick. The brick would cost a good deal more. I could tell just what that brick would cost. I could tell from my supporting notes.

As to "Paving brick against concrete wall," that adjoins the driveway on the easterly side of the building. It is merely paving brick against a concrete wall. The other buildings there are comparatively small buildings, and here we put in no equipment either, that is, none of the machinery or equipment of these buildings. Fixtures in connection with the plumbing and gas and electric are included. Of course, if we were building a building, our firm would sublet the plumbing. We would probably have the contract for it, but we would sublet it to a plumber. To get the plumbing costs in here, we worked out a detailed cost and then I checked those to see if it was about right for the cost of that much plumbing. We let a great many plumbing contracts in a year. The grand total figure for all of the buildings of this company at these two locations which are listed in this exhibit is $752,133.51. That represents the cost of reproducing these buildings as of June 1st, 1923, on a basis of a sub-contractor working for a general contractor. Our firm is considered the sub-contractor, and a general contractor is building the whole plant, and we have [fol. 227] the contract for putting up the buildings as a sub-contractor. The price bid would be my price for constructing these two plants. Of course if we started in to build these structures now, we would have to make an assumption for the purpose of this appraisal. It would take about ten months. We would have to assume some time, in order to establish our overhead. The overhead goes along with the job, and we assume that the job would last ten months. When the buildings were completed, they would be entirely new buildings. This valuation was made on the basis of prices existing on June 1, 1923, not discounting the future one way or the other.

[fol. 228] It is the reproduction cost new—as of June 1st. It means prices prevailing as of that date. And it means the buildings that were there at that date, too. It takes

nothing that was added since. Nothing that was under construction at that time or anything that has been retired since. For anything I know, one of these buildings may have been dismantled in January. It is the property, the buildings that were there June 1st, 1923. I have determined the reproduction cost of those buildings at prices prevailing at that time for material and labor. I have called it "valuation". That is the title I have given it. I was requested to go there and prepare an inventory of certain classes of property. I went there and determined after that observation what the unit prices of those properties were, and drew my schedules and conclusions accordingly. That is, I went there to observe what was within the four corners of the plant with respect to certain classes of property. I did not take into consideration whether those buildings were used and useful or not. Having got the measurements of the building and so on, I compiled this schedule and determined upon the unit cost of the various kinds of property that I saw there. Then I proceeded to get my [fol. 229] estimate on the basis of the prices that prevailed during or about June 1st, 1923. What I have here is not what in my estimation it would necessarily cost to reproduce what I saw there within ten months of June 1st, 1923, but what it would cost in a period of ten months of June 1st, 1923, using the prices prevalent as of that date. I would not say as a matter of certainly that the prices I used might not during that period of ten months decline or the cost of material might decline. I would not say that they would either decline or increase. I assumed those were the prevailing prices on which this reproduction cost would be based. The fact that the buildings or the structures may have been old or may have been out of date construction I entirely disregarded. I simply reproduced what was there as I saw it. Out-of-date construction would be construction that was obsolete and not economical to use with the present kind and character of material. The buildings out there are not obsolete and would not be made out of other material. It is not obsolete; it is not out of date, it would be up to date. The two generator houses are brick. They are not of the type that I would build the same class of structures of now to house generators; I would say that the walls should be brick and that the roof should

be supported the way it is. I would say that they could be reproduced economically at the present day, and it would be good engineering practice or building practice. That [fol. 230] practically applies to the entire plant. I do not recall any building there that is out of date. All the main buildings I would say are of up-to-date construction. I found no cases where the foundation was giving way, I found some cases where some of the materials of which building is composed deteriorates through wear and tear, but through no fault of design. I did not find any unsuitable material.

The Master: I am interested in knowing that too.

I used "Valuation" as a title, maybe a broad title, sufficient to cover reproduction cost. Reproduction cost is a valuation, in my opinion. It does mean reproduction cost new, the books contains that. That is what I mean in the book, reproduction cost new of these structures. I was not asked to do anything other than determine the reproduction cost new here. I was asked to do something else but not with reference to this particular exhibit. I was not asked to determine whether the buildings were inadequate, unsuitable or out of date, or anything of that sort. The buildings were not constructed of unsuitable material or of poor material. There was no deterioration due to faulty design. Whether I was asked to discover that fact or not, I am prepared to say.

Mr. Ward: I have some other objections to make to this [fol. 231] exhibit. I object to the receipt of this exhibit on the ground it is irrelevant and immaterial; that reproduction cost is not a proper element to be taken in consideration in an action brought by a gas company to have a rate declared confiscatory.

Mr. Ward: If the Master rules against me on that, I have an other objection.

The Master: The objection will be overruled.

Mr. Ward: Exception. Then I object to the receipt of this exhibit unless a further exhibit is offered showing what the accrued depreciation in this plant is, as of June 1st, 1923.

(Plaintiff's Exhibit No. 34 for identification is now received in evidence.)

I did not take account of variations in prices in either direction during my assumed period of construction. That is what I intended to convey. In my business, I keep track of prices and wages very closely. There is a trend from time to time in prices of brick and other material. Since June 1st there have been slight changes. Certain materials have gone down. Certain materials have remained steady Cement has gone down 10 cents a barrel. So far as skilled labor is concerned, it has all gone up quite appreciably. It [fol. 232] is almost 25 per cent on this reproduction value.

Q. I say, it has gone up?

A. 25 per cent now on skilled labor only. As I testified before, I used the Union rate of $10 a day for bricklayers, and limiting that by saying that it was not prevailing at that time, although we used it for the purpose of this appraisal, but you could not obtain bricklayers for less than eleven or twelve. In fact, when this was being made I was paying as high as thirteen and fourteen; but those were considered as bonuses. Since that, that bonus has been absorbed in the Union scale. In order to obtain bricklayers now in the Metropolitan District, you have to pay $12.50 a day. There was not any real date for absorbed tion in the Union scale. It came out as a bonus at one time, and then it was gradually absorbed and became a regular Union rate. Labor has not gone down since the first of June. As to joiners and carpenters it is practically the same condition. When I said labor has not gone down since the first of June, I was referring to bricklayers' wages. Carpenters have gone up, by the same process of bonus being absorbed. Most of the trades have gone up by the bonus, and they have all gone up 50 cents a day since the 1st of January, as you probably saw in the papers this month. Cement is down. Unskilled labor is practically the same. It varies according to the difficulty of getting helpers and laborers, but it is practically the same. There has been [fol. 233] no recession in any labor cost. The skilled labor has gone up.

Brick is practically steady. I have used $19 as the long side price in my appraisal, and the brick today is eighteen or nineteen dollars. It has been practically steady during the period, the seven month. Yellow pine lumber has gone off. Gone off six to seven per cent, I would say, right

through the list, spruce and yellow pine. It went off during October, to the best of my recollection. Lumber prices started to soften, deliveries were better. I have given you cement. Those are practically the largest items occurring in these buildings. Cement has gone down 10 cents on the barrel. Taking 10 cents out of $3.30 a barrel, it is in there at three thirty less forty cents return for bags. It is in there at $2.90, and it has recessed to $2.80, or $3.20 gross with the bags. Otherwise I would say the market has been a steady—material market. Steel, I would say has been the same. With these changes, if I had figures on the whole job at any time since June 1st, it would have been more than what I have here. The increase in labor would greatly overcome the decrease in material. If I had made this up at any date subsequent to June 1st, it would show a substantially larger amount. Previous to June 1st the market was quite steady. There have been very heavy fluctuations since the war. I am just going back. I am giving you an idea of what we consider steady in these days. There have [fol. 234] been very large decreases and increases in costs. Our cost has increased in some cases over 100 per cent; in some cases 138 per cent. Fluctuations I am talking about now, increased and decreased. Cost could not decrease 100 per cent. I am talking about increasing 100 per cent and decreasing 50 per cent. As a result, the fluctuations have been very great. Up to about a year ago this October, 1922, when prices showed signs of steadying down. In other words, we get a market that we can depend upon and could buy brick every three months and I could really get it at that price. The same thing when there was a reduction. Always prior to that we could not depend upon prices. So the whole market from January 1st, 1923 up to June 1st, 1923 was in a much steadier condition than it had been in any other five months period previous to that since the War. That, of course, is very general, but the market was steady; from January 1st to June it was steadier than it had been in any previous five month period since the War. June 1st that I have used here had practically the same level. My index from 1914 to the present time figures that I have produced during a period of quite a few years, gives in percentage how the prices vary. Every five or six months we make an index period, consisting of the materials, labor,

and so forth, entering into building construction. It goes back to 1859, as a matter of fact, pre Civil War, but I have index figures from 1914 on, pre-war prices. I have taken [fol. 235] 1914 as the basis of 100, and everything is 100 plus, from that time on. It never went below that. It was highest at 238. On June 1st, 1923, it was around 212. It is approximately 210 in June, 1923. On January 1, 1923 it was 205. There was a very small increase, about two and a half per cent increase between January 1, 1923, and June 1, 1923. This means material and labor combined in weighted averages, as they occur in building. So a structure on June 1, 1923 would cost 212 per cent of what it would in 1914. And on January 1, 1923, it would be 105 per cent more because my index number is 205. I have no figures for January 1, 1924. My index carries me down to June 1, 1923. The index when it does come out will be more than 212, January 1, 1924.

In August 1920, that was the peak. October 1, 1919 it was 184. It has been lower than that. July 1, 1921 it was 176. On April 1, 1922, it was 162. April 1922, it was the lowest point since the war. These are my own index figures, and I want to explain how they were arrived at. These are my own index figures, as applied to labor and material as they occur in the average gas plant building. We took a [fol. 236] sample building of a purifier house, a sample building of a generator house and applied all of our prices as of these dates. That is the way these are produced. I have already testified that I have not yet produced an index number for January 1, 1924. I did not make a prognostication about it, but I say that it is higher than June 1, 1923. How much, I have not testified. As to being considerably behind in our building construction around New York City, it is very hard to judge. You read the papers one day and you find the housing is very short, a shortage in housing, and then you find tomorrow to-let signs around New York. It is very difficult to say. I drive down the Concourse almost every day, every other day, and I see some to-let signs there. It is a great comfort to the builder to see that there are some to-let signs around, sometimes. I would say of my own opinion that housing was somewhat behind. I don't know about the industrial. When tenants are looking for a place to live, they advertise their wants. When an

industrial corporation or a factory or a company want more buildings, they do not advertise it. It is very difficult to say what the demand is for factory construction. The labor that we use in constructing buildings, of the kind that are being constructed and have been constructed by the Kings [fol. 237] County Lighting Company, is almost identical with the labor that we would use in constructing an apartment house. What would affect the problem of obtaining labor for the construction of apartment houses, would also affect the obtaining of labor for the construction of buildings of the kind used by the Kings County Lighting Company.

As to the market for structural steel now, the deliveries are much better during the last four months. There has been a natural slacking in demand in steel during the last six or eight months, and uncompleted orders of the steel companies have been less during the last three months than at time prior to that. There have been no acute situations developed in the labor market since November 1st up to the present time. The demand for labor and the supply of labor is about seasonal, I would say. Last summer there was an acute shortage of plasterers and bricklayers. I was paying plasterers $15 a day. If they do not increase the size of the unions, it will be normal. That did not represent the [fol. 238] peak of a plasterers per diem because I know of cases where they were getting $18 and $20 a day, $15 as the average is what I said I paid last summer for plasterers work about New York City. Of course this is hearsay, because it is not my own experience. I did not pay higher than from $15 to $18, or $15, I think is the highest I paid, but I have heard of their gettin- $26 on a building where a loan was due and they had to complete, and they were offering $26 a day. I think that is about as high as I ever heard of a plasterer being paid. That is, without overtime. This is for an 8-hour day. I don't think they went any higher than that. They might have gone a little higher, because there is no limit to a bonus on a building being built by a speculative builder where he does not expect to be a contractor again. There is no limit to that. I have made a study of the various plateau of prices and costs of materials and labor back as far as 1859 and we have worked up a curve from that date. I found a rise in price levels during

and after War periods. I have made a curve now, a curve subsequent—to indicate their subsequent decline since 1859. That covers the field of materials with which I deal constantly, and I am familiar with them. I have no history of a decline going down as far as it was prior to a war period [fol. 239] The decline after the Civil War was in 1872 and 1877, where a panic ensued, and there of course the gold dollar basis had something to do with it. My study of economics taught me that there is a very sharp rise in prices during a war period and then a gradual decline. In no case have I any record of the prices going back to the pre-war level. They recede, but they do not go back to the original level. They seem to reach a higher plane in every case, and it is proven by the last war; it is proven by the Spanish War and it is proven by the Civil War, that prices rise in every case. There is a period between wars where the prices are more dependable and more uniform. What I was trying to bring out in my testimony when I testified as to prices of January 1st, to June 1st, 1923, we apparently, had reached a period where the prices were mor- or less steady—I would say that we were practically in such a period now, although the usual term of recovering from a war fluctuation is generally in about twelve years. I think we are arriving now, after a period of four or five years after the War, to point where we are getting prices on a steadier plan. I mentioned brick as an item which was getting down to a very steady basis. That mean- the final, after-the-war level that I spoke about a moment ago. I think $19 brick along-side is a steady brick price, corre- [fol. 240] sponding with the prices of fuel and labor up the river. The principal source of supply at the present time is the North River, at Haverstraw is the largest. Brick, as in any other clay product, is produced almost entirely by labor. It has no practical value in the ground, so that the principal item, the fundamental item, is the labor used in getting it out of the ground and burning it in the kiln. Then the item of fuel comes in, which as you know, is very high—almost two and a half times the pre-war price. Common labor, instead of being around $2 or $2.50 a day, has gone up to almost $7 a day. I am speaking now of the labor in the kilns, so that the price of brick, the price of the constituent costs of brick—the price of the constituent costs of

brick is practically two and a half times, so that would give you, on a basis $8 brick, practically the price today, so that the selling price of brick at $18 or $19 practically represents the increase in the cost of its production. Cement is from up the river near Hudson, and also sown near Nazareth, Pennsylvania, the principal sources of supply. Hudson is 120 odd miles from New York, and Haverstraw is only 36. I am speaking of Hudson, New York. Cement has to be burned the same as brick. They are crushing and burning it. [fol. 241] That process is similar to that of producing lime. The cost of a concrete wall the same thickness as a brick wall having the same amount of work, is practically identical on account of the cost of the forms. Cement in itself is much cheaper than brick, but in order to have the forms to support the wall, the cost of the concrete work, when completed, is about the same as the cost of the brick wall. That would involve the use of the forms again. We can use those forms repeatedly, but the principal item is the cost of labor required in constructing the forms and putting them in certain locations. We take into consideration the price of the lumber going to make the form, but we do not throw it away after one operation. It is always used a number of times.

The values contained in this exhibit are based on prices as of June 1st, 1923. There were no peculiar conditions on that date that made my valuations as of that date unusual or abnormal. Within a reasonable time before or after that date my valuation would be approximately the same.

I examined the condition of these buildings, mostly for the purpose of enumerating the items that needed repairs, such as wornout or weather-beaten portions that needed replacement. The conditions of the buildings was very good. The needed repairs compared with the total cost of the plant, were few. I have listed them. The sheets I pro- [fol. 242] duce, three in number, contain a list of the buildings, under which I have placed the items and estimated the amount to do various miscellaneous repairs, and I have totalled the amount on the last sheet, which is $1,439.50. These buildings are all at the 55th Street Works. These are the amounts that I would then make these repairs for. These several buildings would be in first class condi-

tion. By first class condition I meant that the building in no portion was in need of any repair. I know of no way in which they could be made any better from the point of view of utiority after these repairs are completed, so far as stability is concerned. They would be the same as a new building. I made out this list myself and noted the repairs that were to be made and made an estmate of the cost of them, right on the job.

Mr. Moran: I offer that in evidence. That is our accrued depreciation, Mr. Hyatt.

The Master: Any objection?

Mr. Ward: I object to it if it is offered as being accrued depreciation in this land. If it is offered to show what repairs are needed to the buildings at this time, there is no objection to it.

Witness: This is also approcimately as of June 1st, 1923.

The Master: He has testified to what it represents. It [fol. 243] will be received and marked in evidence.

(Marked Plaintiff's Exhibit 35.)

Referring to Plaintiff's Exhibit No. 35 these items contains a description of work that I saw in the plant of the plaintiff necessary to put the plant in a state of repair with respect to these items. That is, I went around and observed, that there was some plastering to be done in two locations. And that answer, so far as the type of answer is concerned, covers the same thing with respect to each and egery other item on these three pages. It costs less to keep a new building in a state of repair for a period of three or four years. I would not say that the ratio of rate of repair tends to increase proportionately as the building or structure gets older. It is not an increasing ratio. A new building in three years should need very much repair, assuming a fairly decent and proper construction at the beginning. That is just the time for the first coat of paint on the sash. It depends upon the type of building. I would not put on one coat every three years, or maybe two coats every three years. It costs more to keep an old building in a state of repair than a new one until the period of four or five years had been reached. Plaintiff's exhauster house would be the principal building subject to vibration by rea-

son of the operation of machinery. Of course, the hoisting engine would be the center of vibration. The principal brick buildings that have a peaked roof are all slated, at the 55th Street plant. They have no ordinary wooden [fol. 244] shingles down there. The type of gutter used in the buildings is mostly galvanized iron; some cast iron. I do not recollect seeing any copper. I do not think there is any. I cannot be sure. I do not remember any copper just now. In a gutter and leader galvanized iron in this locality sometimes give- out in four years and sometimes in eight. It might be more susceptible to giving out in salt air than it is in interior places, away from salt water. More moisture laden air would naturally cause dampness; but I should say if the gutter and leader were kept clean and painted, that would increase its life more than the fact of whether the air was damp or not. The buildings I observed down there that were purely sheet iron construction in the walls is a junction house for conveyors made of siding. It should be painted about every three years. I have all the measurements of all these buildings in detail.

[fol. 245] Land

David Porter and Lewis H. Pounds, having first described their respective qualifications to value real estate in the territory where plaintiff's properties are located, testified as experts as to the value of plaintiff's real estate used and useful in its business of serving gas to the public. They testified that the reasonable and fair present value of such property as of June 1st, 1923, was the sum of $994,002.

JOHN H. DUNCAN

Direct:

I live at 238 75th Street, Brooklyn. I have lived there seventeen years. I have been in the general contracting business, eight years for myself. It is a corporation. The name of it is John H. Duncan, Incorporated. I conduct a contracting business through the medium of that corporation, and have for the last eighteen years. I carry on contracting in a very general line. I tore down a church, but

I have been working more or less on public utilities. I [fol. 246] have been taking out and putting in foundations of the buildings, built some of their smaller buildings, and foundations for their engines; I laid conduits for the Brooklyn Edison one summer, all they had during the War, and for the Kings County I have done considerable foundation work. For the last five years I have done all of their main and service work. I do work for other utilities besides the Kings County. For the plaintiff I have done all the main laying and the service work for about five years. I have laid a little over sixty miles of services and nearly nine miles of mains. We usually express it in the number of feet, 316,961 feet. I have got the number of services right here, but we laid all that was laid in the last five years. We do work for other public utilities, for the Brooklyn Edison, I laid all the conduits in the street for them. That was [fol. 247] in 1918. We laid them under contract, more than several miles, and in connection with that we had trench work and back fill. We have done contracting work for other public utilities, the Brooklyn Edison, the Brooklyn Union gas, the B. R. T. I laid several miles of water pipe for the Bush Terminal Company, about 11 years ago. That is before I went into business for myself. I never laid any gas pipes for the Brooklyn Union Gas Company, but I have for the Brooklyn Borough. We laid the gas service in that development at the old Gravesend racetrack, when they developed that, cut it up and built houses there. We laid all of that for the Brooklyn Borough. They furnished the pipe, and the cost of the labor and other materials ran about $30,000 about three or four years ago. Before I went into business for myself, I was a partner with Barth S. Cronin, Inc., for seven years prior to that. I was a shareholder in the corporation of Barth S. Cronin, Inc. I was actively connected in his business. That company engaged in the general contracting business. I did not get into the laying of gas mains at that time. We did not lay any gas or water pipe of any kind at that time. My experience in laying water pipe, gas mains, street conduits and gas services has been what I have gained since being in business for myself. I had a contracting experience with Barth S. Cronin for several years before I formed my own com- [fol. 248] pany. That is the limit of my experience as a contractor, but I had followed contracting work all of my

life. My first experience was on the subway in Boston. My first real experience was on the Crosstown Section in 1901, here in New York; then back to Boston on the subway; and then I came back and worked for two and a half years for the Bush Terminal Company in the building of the Bush Terminal. I was not an engineer, I had charge of the construction for the Bush Terminal. That was not built under contract; they had their own forces. I had charge of their own forces that put in the foundations for the buildings and built some of the one-story buildings they had there. It was that engagement which brought me into contact with Brooklyn. I have been here ever since. I am familiar with the distributing system of the Kings County Lighting Company. I know where it is laid. I have made all the extensions to it for some time. In laying the services that I have laid in the last four or five years, I have come in contact with the entire territory. My experience brought me into every block; certainly every block that has been developed. There are some sections that have not been developed at all, in which we have not been yet. There was some developed with services before I got into it. That would not be a substantial part of the territory but a small part of it. I have considered what it would cost to build that system, that distributing system—that distributing system in this past year. I have considered it from the standpoint of making an esti- [fol. 249] mate that I would actually reproduce it for; an estimate of what it would cost to actually reproduce it in the course of two years. No plan or specification was furnished to me for a bid upon it, but it would be the same specification that we have worked on. In other words, it would be the same thickness of lead, same amount of yarn, same specification for pipe, and from the amounts and number of feet as furnished to me by the gas company, the number of feet of services of different size of mains that were actually laid. I have considered what I would reproduce it for, but I did not count the services, I took the number of services that company gave me. I did not check them up at all. The length of the mains in the streets, I took from the company. I did not check them up at all. They have a specification for cast iron pipe and they refer to the American Gas Standard of the American Gas Association. The gas pipe is standardized. In other words, to set it apart from water pipe or some other kind of pipe, a gas pipe is a certain

weight per foot—within ten pounds—or around ten pounds per length. For instance, a six inch pipe, if it complies with the standards, will weigh a certain number of pounds per foot. And a 12-inch will weigh a certain number of pounds. [fol. 250] That weight is fixed by the American Gas Institute. It is their specification. That is the kind I have been laying for the Kings County in the last five or six years. The services are standardized too. They specify a pure wrought iron pipe as distinguished from a steel pipe and malleable iron fittings, and laid in a certain way. I figured them, really, on this reproduction, as though it were a project in view. I have figures based here upon it.

(Produces folder.)

(Marked Plaintiff's Exhibit No. 36 for identification.)

I have not any label of mine on the outside, never had any at all. I did not take it off after Mr. Burt revised his. Plaintiff's Exhibit No. 36 for identification here is made up of nine sheets, the first of which is a summary of the contents of the others. I divided the work up here. My first general division is costs of laying cast iron main in the street. That includes material labor and everything. I have the cost of wrought iron and wrought steel main. That is comparatively small. Repaving over the mains is set forth as the streets now are. Repaving as it is now or would be now. Then I have repaving over wrought iron and wrought steel mains. The special material on sheet 8 is the valves and special fittings, such as reducers, the governors in the governor pits, valve boxes, line drips, drip boxes, and curb boxes, that necessarily enter into the sub- [fol. 251] service structure, to operate the gas mains. I have put in for the company, drip boxes, valve boxes, governor pits. We have done them all and have laid all kinds of main. I have never laid any 24-inch. I have never done any of that. There is no 24-inch in the streets, but there is in the yard. I might say that I dug it up and cleaned it out once or twice. I have the cost of repaving over services. My sheet No. 2 shows cost of material in mains. In the first column are the different sizes of mains and in the second column the length. I have been told that corresponds with an exhibit already put in. I have seen a copy of it too. I have seen the copy in the case. I have read it.

I assumed the quantity of pipe and tons required. There were 18,480 tons, 2,000 pounds each. I computed the tonnage by taking the specification of the American Gas Association which gives you the number of pounds per foot of pipe. You have the total number of feet of pipe of different sizes, multiplied by the pounds per foot, which gives you the total pounds. Experience teaches me that we have about a three per cent loss in laying cast iron pipe, so add three per cent to that and divide by 2,000 which gives us the total number of tons required to lay that many feet of pipe. The specifications state the number of pounds in each foot of the different sizes of pipe. I used what is in the specifications. The human equation came in, as far as I was concerned, only by adding three per cent for wastage. [fol. 252] The next column is Cost Per Ton. I state there that I figured what the pipe would cost if I were going to lay the job, based on prices received from the American Cast Iron Pipe and Foundry Company, to supply that many tons of pipe or feet of pipe within two years. The quantities I have given here are as of June 1st, and the price is as of June 1st. In the next column No. 5 I figured up just what the cast iron pipe for the main, that would go into the mains of this company—would cost. In column 6 I have set forth, the cost of other material per lineal foot. That is the cost of all the other material outside of pipe that enters into it. There is lead and yarn and blocking and any lumber that we would buy for barricades or such things as that. I gave that in cost per lineal foot. The material other than pipe—in a 6-inch main would cost 13.1 cents per lineal foot. I did not compute for this case so much lead. That is what our records show it costs us per lineal foot to lay the different sizes of pipe. We have reduced all our costs to price per lineal foot. I only laid it for this company in the last few years. I took my costs and reduced them to a lineal foot basis, and these are the figures I got, our actual experience. It has been reasonably uniform all the way through. It costs about 13.1 cents for other material, for the six inch material. Lead and yarn are the big elements in there. Lead is the biggest. Lead alone [fol. 253] would be more than half of the 13 cents, and that would run through all the other items. I would say lead

would be 70 per cent. of the cost, all the way through there. We have to use some lumber for blocking up. Not so much in the district out there as you would in other districts, but there is some part of that district that is soft and inclined to be wet, and we use more blocking than if it is hard, if it is a hard surface we just use a piece of 2 by 4 on either end. In the next column is the cost of the other material based on the number of feet of pipe to be laid. In the 8th column is the cost of pipe and other material, and finally in the 9th column I have reduced these costs to cost of material per lineal foot. It is customary, when we think of laying cast iron main, to think of the cost per foot. That is the way it is customarily laid. That is the way contractors think and talk about it and one example is the City laying it, laying pipe per foot. If you calculate to lay water pipe for the City it is so much per foot and it is for laying it and including materials. I have worked this up in the same way that I would a contract. The last column there is a division of column 2 into column 8. We have not reduced the price of pipe to the foot basis. If we take column 9 and subtract from it the cost of other material we get the cost per foot of pipe. I have given the pipe here rather in tonnage than in lineal feet, that is the way we buy it. We are following your practical experience in giving it that way, because we buy it by the ton. The material in the mains I computed [fol. 254] here at $1,462,051.96. On the next page 3 is the cost of labor in laying mains. This is all on a foot basis. The costs of labor for excavation, hauling, laying mains, back filling; in other words, everything on the job in the field, is one division. The cost of insurance per lineal foot is another division. The cost of administration is the third division, and then the total cost per lineal foot for the labor. The labor of laying mains is usually thought of in that way, per lineal foot. These three parts is the division in our own accounting, the way we actually keep our accounting with those controlling accounts. Our records would show our expenses divided into these three classifications: The expenses for labor. It is from that I state these figures. These are the actual expenses that I have had in 1922. I would like to qualify that just a little. There were some of these sizes that we did not lay in 1922, and we had to go

back to the years we did lay them and make the necessary adjustments due to fluctuations in labor and material. We did not lay any 8 in 1922, we laid 8 in 1921. We laid 6 inch and 4 inch pipe every year. The 6 and 4 inch pipe are all the same cost for laying. That is my experience. The same conditions apply to 3, 4 and 6, and 8 inch is two cents more per foot. $1 a lineal foot for laying pipe up to 6 inch is a reasonable price, up to and including 8 inch. That would be a natural conclusion based upon my experience; if anyone asked me what it cost to lay 6 inch pipe, for example, and somebody furnished me pipe, I would say about a dollar a foot.

[fol. 255] I have been here for the last 15 years, but before that time I did not have any experience of the nature of a trench. I would not say the soil up there was easy. I do not know whether it is rock but some places you hit boulders that are very expensive to remove. You could do a lot more shoveling per man in sand, but you would have a lot more shoveling to do, because you banks would come in. In this district the big part of the district is very hard soil, so that you have harder shoveling per man, but you do not have to shovel so much. You can say that is either hard or easy excavation, just as you are inclined. If you hit the boulders, they make it very difficult sometimes.

Page 3 is the labor cost per lineal foot and on page 4 I bring together the labor cost and the material cost per lineal foot. The cost of material per lineal foot is taken from page 2 and then I get a total cost per lineal foot which is stated on page 4. It varies from $1.633 to $11.11. That varies as to every size. That is true for material; cast iron main. There are a number of things that enter into that cost. There is the additional weight of cast iron, additional amount of lead in the iron used, and then when you get up above a six inch, you have a larger trench to dig, more excavation. My final column here is the total cost of laying mains. When I say "laying mains" I mean the complete cost of laying the main, pipe, labor, material and all. I have called the pipe when you get it into the ground the main. The definition that the gas company use of main is [fol. 256] the pipe which the services hook on to. After it is in the ground it is the main and besides this material and labor cost I have a 10 per cent addition to cover con-

tractor's profits, anything that might come up that you cannot foresee or never have experienced. You might get a flood in the district, for example. It would cost you a lot of money to fix your trench. A heavy rainstorm will impede my work, in some parts of the district. In the valleys, it is apt to wash out the trench. We do have them wash out the streets out there sometimes. We have some wrought iron and some wrought steel mains. Wrought iron pipe up to four inch, I put in at the same cost per foot as the services further along in the exhibit. That is, for labor and material both I put in at the same cost, because they are wrought iron up to four inch and wrough- steel beyond four inch, and in the wrought steel pipe I have used the same cost for labor as I did in the cast iron pipe, but I got new prices for the pipe and fittings and applied them to the cost of labor to get the total cost per foot. The total number of the wrought iron and wrought steel mains are on another exhibit. There are not many of them. On page 6 is the cost of repaving over the mains, that is, as they existed on June 1st, 1923. On second column, length of main, each size, under pavement in lineal feet, those figures are taken from the gas company who furnished them. They are on another exhibit. I am giving a uniform price per lineal foot here for some sizes up to and including eight [fol. 257] inch. I got that figure from our actual experience based on the City's published rate per square yard for resurfacing. We cut through the street under permit from the City, and a certain size trench which is the same width for any main up to eight inches, and the City charge a certain rate per square yard for resurfacing that street, that portion of the street, and we have arrived at $1.10 per lineal foot in this way, based on our experience. We may, for example, cut 14 inches wide for a six inch main. Then the City may not resurface that street for a year afterwards—we have had experiences as long as 18 months—with the result that the opening is a good deal wider the day they come to resurface it than what we cut it, but the City charge us for resurfacing the actual amount that they resurface, disregarding the number of square yards that we cut and that is the basis of what it actually cost us per lineal foot. This $1.10 per lineal foot is the equivalent of the City's price per square yard for restoring pavement

based on our experience of the additional width that they charge us, that is, they will charge us by the square yard, $7 a square yard for asphalt. I know how many square yards I have got to pay for, out of a certain number of lineal feet of pavement and this $1.10 is the equivalent of that, as gleaned from my experience, and the higher price is for the 12 inch and $1.59 for the 16 inch. That is explained by the additional width of the trench that is required. It is still the City charges. When we contract with the company, we contract to put back the pavement; [fol. 258] that is a part of our work. For the last two years we have done it ourselves because the City is not equipped to do it. The City has outgrown their asphalt equipment here in Brooklyn. The City has not permanently abandoned the practice of restoring pavements that have been cut over the mains; they reserve the right, on 24 hours' notice, to make us stop and do it themselves. We have men working on it. They are doing that for the Kings County Lighting Company and they do resurfacing for the Brooklyn Union. There is a certain amount of wear and tear and a certain amount of other things like that, that they do. There is no other way to do it. When we lay gas mains we have to cut a main sometimes when we lay services. We have restored the pavement over the services for the last two years. What I said with respect to gas mains holds good with respect to service also, that is, except as to price. We are just talking about services. We do not lay any services for water connections to the City water mains. That is for a plumber. I am not licensed for that and I could not tap a water main. Plumbers tap the water mains and put in that service. They estimate the amount of paving that will be disturbed and the plumber has to pay for that. The City restores it. I have never resurfaced any street, under contract with the City. All the resurfacing that I have done has been under a contract with this company for laying mains or services.

[fol. 259] The next sheet, No. 7 is the same thing except that it relates to wrought iron and steel mains.

Sheet No. 8 which is the special materials that I spoke of. The number of valve boxes and governor pits and line drip pots, drip boxes, and curb boxes are taken from other exhibits in the case and I put a price on them. That is on

Exhibit No. 7. Most of them are just for the material. That goes in with the labor of laying the mains: It would be true of drip pots. It would not be true of a governor pit; a governor pit is a separate unit by itself. The inside diameter is six by eight by seven, seven feet high in the clear. Curb boxes at $1.80; that is the cost to us, delivered in Brooklyn. I have not got anything for labor. The labor is in the cost for services. The name "drip boxes" is a little misleading here, because the curb boxes are on the surface. I only have 1636 of them. One does not go with every service. This is only on a house larger than three families. The services that serve the house that is larger than three families must have a curb cock in the curb box at the curb stone. That is nothing new. They were going to put it on every gas service instead of just entering the houses—I presume that comes under the Tenement House Law. In our territory, wherever a service supplies a house of more than 3 families, it has a curb box. That is a place where they can shut off the gas. That is right out at the curb stone. It is right at the surface. [fol. 260] The drip box is a box that is set over the street to locate the pipe, where you pump the liquids out of the drip pots. There are some that don't have boxes in them apparently. It has been the custom, I think, where a street has been cut through, where they put a gas main through, of not putting a drip box around the end of that pipe until the street was paved.

In the second column we have the total length of each size of service, in feet. We got that from Exhibit No. 3 from the Gas Company. We also have the cost of laying, per lineal foot. It shows the same price all the way through because you dig the same size trench. Where it is laid from the main to the lot line or whether it is laid to the meter, it is all the same. That is the minimum size trench that a man can work in. It is the same whether you go inside the lot line or not. It keeps the same cost per lineal foot. That is 62.1 cents—what we got from our customers in 1922. The adjustment in the cost of labor would be the 1923 figures. The adjustment on the labor cost, the cost of labor to us we took the 1922 average price and made the adjustment for 1923. We were laying services during 1923; we didn't use the actual prices there because if I

made this up as of June 1st, there would be a very small part of the season there. We didn't have a long enough period to do that because that started about the 1st of April in a small way; but by this time we have the 1923 prices. There is no discount here for a large number. It would not make any difference. If you were going to do the whole job, it would be cheaper than if you were doing it [fol. 261] the way we are doing it now. The price I have here is for the whole job.

Take the next column, cost of pipe and fittings per lineal foot. Every service we put in has a street elbow and a nipple and a street tee and a plug and pipe with couplings.

In other words, we come up with what is known as a flexible joint, up to the main, so that if a little dirts gets in there it will not break the pipe. The pipe is tapped on top. There is a certain amount of flexibility in that. The pipe on this sheet does not include curb boxes. In regard to these pipes and fittings these prices are based on our actual experience, over a period of a year. I have an account of the cost of pipe and fittings that went into the laying of services in a given period. I totaled that up and divided it by the number of feet laid and I get the average price per foot for the different sizes. I have to keep each one separately, because they vary slightly. The 1 1-4 price was based on directly after the war. They have not laid any 1 1-4 inch pipe in that district for three or four years, that is the most recent experience in laying that pipe. If we were laying it all at once, I think the cost of 1 1-4 inch pipe would be less than 1 1-2 inch. There is a substantial difference between the 2 inch and 3 inch pipe because that is the difference in the weight of the pipe. That is reasonable. The pipe increases in weight very rapidly. This pipe is sold by the foot. It is based on weight. The cost per foot [fol. 262] would increase as the number of pounds in the weight increases. All of these service pipes are made of wrought iron. We have repaired services for the company. We find, without any exception, it is wrought iron. That is bought by the foot. We buy service pipe. In our every day work for the company we furnish the pipe for the fittings and services and perform the labor. The company does not have a crew now to lay those services. They have just an emergency crew, that is all. There is some advantage in

having us do it. I think we do it cheaper than they could do it themselves. I might say that we are never loaded up with anything of a political nature, no politician ever sends us any political help to put on, but they do that with the gas company and I know we can do it cheaper, because recently a 1 1-2 service that I put in cost me 24.6 a foot. We are also carrying on our work at other places. Very seldom do I shift these men from work at one place to another. We maintain a force to lay services exclusively and they are kept busy. In 1922 I laid 118,000 feet of services. In 1921 I laid 69,362 feet of services. I am only laying it to the curb but I also lay them all the way in, for the company. I lay services for the company, and also lay services for the property owner from the property line in. That is something concerning which I deal directly with the property owner. I don't deal with the company about that at all. I go right into where they hook the header up for the meter. I don't do the header work. I lay it from the lot line, three inches inside the property owner wall, that is the custom [fol. 263] and I get my pay from him. I have a uniform price for the property owners so that I can tell him how much it is going to cost each time. They apply for it through the gas company. They act as my agent. They collect the checks and give them to me. Then I collect the checks, because a lot of those fellows don't pay directly. I have got here the cost of services per lineal foot, and then the total cost for the different kinds of services and I add 10 per cent for incidentals and profit. About paving over services the information was given to me by the gas company. The price of $1.10 is explained in the smaller sizes of the mains. Paving over services, I used a uniform price of $1.10 per foot and that was the same price I used for the small mains—1½ inches, 2 and 3 inches. When I gave that testimony I took it from the cost of paving over services. It was the same price. $1.10 is our average cost using the City's $7 per square yard for asphalt paving, and that is our average cost per foot when the City did the paving at $7 per square yard. We are doing it now; that is the equivalent of $7 a square yard. Not all of the services have pavements over them. The pavement never covers the whole length of the service to the lot line, except in special cases because there is a sidewalk there. That sidewalk—in the

cost of laying the services I take care of the sidewalk. I have 20,342 services. That is the number of services that are laid under permanent surfaced streets in the districts. Out of a total of 26,168 there are 20,342 which are under [fol. 264] surfaced streets, but that is nothing that I know about; that is furnished by the gas company. When I speak of pavement I mean everything except dirt. This is the definition of paving the high-way with any artificial surface on the street that is acceptable to the City. In our classification here asphalt, asphalt blocks, brick and so forth goes in as a part of "pavement." We made no differentiation then between the different kinds of pavement because the big majority of the pavement in our district is asphalt. There is very little of anything else. Only a difference of about 15 cents a yard in "pavement over mains"; it runs the same there. Up to 8 inch, I think; beyond that it is higher, due to the increased cost of—due to the increased width of the trench, but not as to the kind of pavement. Both as to pavement over mains and services, there is no difference in price on account of the different type or style of pavement. That is the average cost to us for paving. We would take the total amount of cost of paving for the year 1921 and the total number of feet of service and mains, divide into their different sizes, and the total cost that the City billed the gas company, and they in turn deduct it from our bill. They take the total number of feet, divide that into the total cost of paving, and give you $1.10 a foot. If you took the different kinds of pavement I think the average would be the same. There would be very little variation. It would cost about as much on an asphalt street as it would on a granite block pavement, there is 50 cents a yard difference out of the total of $7.00 a yard. The total number of services multiplied by average length of service [fol. 265] under pavement was seventeen feet. That was gotten by taking 2,000 services, long and short, and averaging the number of feet; the average number of feet in 2,000 services under a permanent surface. By "long and short" I mean our mains are set three feet from a curb, so that if you are on the south side of the street, you only have three feet maximum that you can get, or four feet under permanent surface, whereas if you were hooking up a house on the north side of the street, you would have practically the en-

tire street under permanent surface, all but three feet. And then for every two services, on opposite sides of the street, we have the total width of the pavement. And for those two services we have whatever the width of the street would be in laying pavement, and that would be for the two, 34 feet of pavement, an average of seventeen for each one. The paved surfaces of the streets in Brooklyn run from thirty to eighty feet. The narrowest is thirty feet. We have taken 2,000 services and taken the actual portions of them that are under pavement and got this average of 17 feet. I think that is low, if anything. If these two services on the opposite sides of the street are laid at different times, there is a duplication in pavements. It is only when they are laid both at the same time that you make one cut for the tap-in, as we call it. Then we have a total here for services in various streets and a cost of pavement besides. [fol. 266] My first sheet, the summary, brings it all together. I have checked this; the computations and additions were made by machine. It is correct as being my estimate of reproducing this distribution system, at prices prevailing as of June 1st, 1923. I was here when Mr. Burt testified. Since the first of June, my experience is that labor and material are higher in my line. There has been no recession in the cost of labor that would go into the laying of services and mains. There has been a rise. I got a notice today that the caulkers, for example, that lay the mains, are getting a dollar a day more from the ost of January on. They got a dollar raise in July last year. That is not included in here. There has been no decline and a dollar raise now. They were getting $8.00 before, now $9.00, and they are going to get $10.00. The men who dig the trenches get 60 cents an hour. We were paying that during all of 1923. The caulkers are the fellows that set the pipe and set the yarn, drive the yarn. The laborers put it in the trench; we pay them maybe five or ten cents an hour more than just a common laborer. As to services we have what is known as the fitter. He taps the hole, puts in the fittings and puts in the pipe and cuts the length, puts the thread on the end of his cut, puts a cup on it. I have always furnished the lead and the yarn that go into these jobs and the pipe for the service. I buy that myself and have always done the same thing with [fol. 267] the cast iron pipe up until this year. I used to

buy that. Under the present arrangements I do not buy that. We have no curve or set of index numbers like Mr. Burt has. I could trace the curve that Mr. Burt spoke of there, only it seemed to me that they hit bottom sooner than he said it did—went down to its lowest point before it started up again after the war, 1920. My recollection is he said in August 1921 was the low spot. According to my recollection, around the middle of December in 1920 was the low spot. Any way, it is a question of time there, whether it was 1920 or 1921. I have not kept a curve of it. I have given prices, June 1st, 1923. 1922 would have been less, not a great deal. The price of material would be very little, if any, less. The price of labor in my experience is that it was somewhat less. If it went back, the year before that it would be higher; it would be about the same. 1921 was about the same as 1923. My experience in 1922 was that a common laborer was cheaper. My experience in my particular line would be the same as Mr. Burt's in his, that 1922 was the lowest we have had since the war, the first part of 1922. And the highest we have had since the war I would put in 1921 instead of 1920. That is my recollection, without having given it an awful lot of thought. If I looked up my records, I might find I was wrong. If I had [fol. 268] bid on this job at any time since the first of June, 1923, my price would have been more, if anything. The price of pipe since the 1st of June has increased, particularly services. I order a certain amount for the season, about 120,000 feet of one inch and a half pipe, and I know that I have bought, I think, 31,000 feet at an increased price of about 8 per cent. I know the condition of the mains by being at them every day.

Mr. Moran: I offer this exhibit No. 36 for Identification in evidence.

Mr. Ward: Before this exhibit is received, I would like an opportunity to look it over.

[fol. 269] Brooklyn, New York, January 29th, 1924.

JOHN H. DUNCAN

Cross:

I am acquainted with the territory of the Brooklyn Borough Gas Company. It is southeast of the territory of this company, adjoining it. There is a great difference in the conditions that you find in the Brooklyn Borough itself. This side of Coney Island Street is one condition. On the other side of Coney Island Street is quite a different condition.

If you should tell me that the Brooklyn Borough Company in its 1922 report to the Public Service Commission reported that its cost of laying 4-inch mains was 96 cents per lineal foot as against 1.779 as estimated by me in this exhibit that would not in any way change my opinion as to the correctness of my figures. If you should tell me that the Brooklyn Borough Gas Company in its same 1922 report to the Public Service Commission reported that it cost them $1.52 to lay their 6-inch mains as against 2.187 as estimated by me in this exhibit, that would not in any way change my opinion as to the correctness of my figures. If you should as- me the same question in regard to the 8-inch mains, which they reported cost them $2.04 as against $2.704, as set forth in this exhibit, that would not in any way change my opinion. If you should ask me the same question in regard to the 12-[fol. 270] inch mains, which they reported cost them $3.16 as against $4.087 as set forth in this exhibit, that would not in any way change my opinion. If you should also ask me the same question in regard to the 16-inch main, which they reported cost them $3.39 as against $6.934 which I have set forth in this exhibit, that would not in any way lead me to believe that I had made a mistake, for the reason that the Brooklyn Borough Company laid a vast quantity of mains in dirt streets or open fields, where there are no sub-surface structures to interfere, while the plaintiff's mains are laid in streets in which there are the conduits of the Electric Light Company and city water mains and sewers and trolley tracks. All of these furnish obstructions to laying gas mains in the same streets and they must be protected and made safe during the process of laying gas mains, which

makes it very difficult and expensive. The conditions of the two companies are not comparable in respect of the difficulty and expense of laying the distribution system.

Mr. Moran: Of course, I don't want to object to the examination in any way, but it seems to me to be very misleading. It includes, I take it, both material and labor, the costs you are giving there.

Mr. Ward: That's right.

[fol. 271] If you should tell me that the Brooklyn Borough Gas Company in its 1920 report to the Public Service Commission, reported that it cost them 66 cents for laying one inch services as against 80.5 cents as estimated by me, that would not change my opinion as to the correctness of my figures. They might lay them for a street light. I think the Brooklyn Borough have considerable street lights yet. If you should tell me, that in its 1922 report to the Public Service Commission the Brooklyn Borough Company say that they laid over 15,000 feet of 1¼ inch service at a cost of 63 cents per foot, and that I have charged 82.6 cents per foot for that size, that would not in any way change my opinion as to the correctness of my figures. If you should tell me that the Brooklyn Borough Company reported that it cost them 51 cents to lay inch and one-half services as against 82.1 cents which I set forth, that would not in any way change my opinion. If they reported that it cost them [fol. 272] 84 cents to lay two inch services as against 89.5 cents which I have estimated, that would not change my opinion in any way. In making these estimates, I figured on hand labor.

The governor pit, exclusive of the cost of fittings, pipe, valves and the governor itself, cost $1,265. That is what the company paid for them. I just said it represented exclusive of the cost of the valves, fittings, pipe, and governor—the cost of the pit. That $1.265 represents the cost of excavation, the concrete pit, water-proofing the pit, and [fol. 273] the labor of setting and re-setting all the pipe, valves and so forth. But it does not include the cost of pipe, valves and the governor. So that there has to be added to that the pipes, valves and governor.

I went to the manufacturers to find out the prices of various sizes of pipe when I came to make up this estimate

The United States Cast Iron Pipe & Foundry Company, for cast iron pipe and cast iron fittings, also the Warren Foundry Company. I ask them for prices, but they were filled up so they could not give me any. I did not try to find out whether any foreign pipe — coming into this market. I do not know whether or not any foreign pipe is coming into the market.

In doing this work, I am a general contractor. I have got down here a figure, $2,559,218.76 as the total cost of laying mains, page 4 of Plaintiff's Exhibit No. 26, and of course I have got down here incidentals and profit. The incidentals are conditions that we might meet that we never have. I might illustrate it to you possibly better than I could explain it. We might run across a condition like we did last September, where one of the residents of a district where we were laying a pipe line, a jay walker, crossed a little park and up over a pile of dirt we had thrown up from the trench and dropped down into the trench. I paid out $80 for a new suit of clothes. That is one of the incident-s. We never ran across a condition like that before. That ten per cent. is supposed to be the contractor's profit, [fol. 274] but the incidentals are the things that come out of his profit. That is the first time in the last five years that anybody jay-walked over our trench, that we ever had any accident of that kind that the insurance company would not take care of, but they would not buy him a new suit of clothes; they take care of his bodily injuries. I would not say that there was any part of that ten per cent. that would be set aside for incidentals. So that for my services as general contractor of two years on this job, I get $255,-921.88; that is what I would expect. That is at about the rate of $125,000 a year for my services as contractor. That is the profit to my organization, my company. That is the concern known as Duncan & Company, Inc. I have only got two trucks. I can tell you the average payroll. We run about $16,000 a week payroll. We fluctuate from maybe ten or twelve jobs at the present time to forty. Our entire force would be at work on this job for the two years time I have given. I have ten per cent. incidental and profit added to all the sums of my estimate as to the cost of laying iron and wrought steel mains. And my answer with respect to incidentals is the same as it was before with

respect to cast iron mains. My answer is the same with respect to services. My answer is the same with respect to repaving. The 10 per cent. of this figure of $5,452,650.67 —10 per cent. of that or approximately $545,265.06 represents my item incidentals and profit. That $5,452,650.67 is 110 per cent. of the cost. If that figure was divided by [fol. 275] 110 and multiplied by 10, it would give you the profit. (Figuring.) The dollars, without going into the cents would be $495,695. That represents the incidentals and 10 per cent. profit item on this.

Mr. Moran: Well, I will offer the exhibit. I renew my offer of the exhibit.

Mr. Ward: I object to the receipt of Plaintiff's Exhibit 36 for Identification as being improper, irrelevant, and immaterial, on the following grounds: First, that it is bases upon Exhibits 3 and 7, which exhibits were received over our objections and which exhibits we still claim are improperly received; second, that in the prices used in this exhibit they have not been shown to be the prices for which the material could be purchased if the very large quantities contemplated by this exhibit were contracted for at one time; third, that the labor cost used in this exhibit is based upon the experience of the witness in laying a comparatively small number of mains and services and that it has not been shown what the labor cost would be if the entire main system and services were laid at one time; fourth, that the witness has not been shown to be qualified to estimate the reproduction cost for a big job of the magnitude contemplated by the proposed exhibit; that in carrying out an undertaking of this kind a special organization, equipment and machinery would be necessary, and that the witness has not been shown to have ever estimated directed or been employed on such a contract; fifth, the specific objection is [fol. 276] made to Sheets 6, 7 and 9 and that portion of Sheet 1 which gives t-e estimate of the cost of repaving over mains and services. Both the State and Federal Courts of last appeal have held that such items are not proper in estimating the reproduction cost of a gas plant. As the Master will recall, in receiving Exhibit 7 he stated, page 179 of the record, in reply to the objection of the defendants to the receipt of that part of that exhibit showing the length of

mains and services under different types of pavement, "I am disposed to permit you to show the lengths of pavement that are over these mains, if you so desire, for the purpose of showing the physical condition. That may or may not be material to this hearing. I do not think it will do any harm, however." Plaintiff now proposes to use Exhibit 3 as the basis for estimating reproduction cost of cutting and replacing such pavements. Sixth, objection is made to the entire exhibit that the reproduction cost is not a proper measure in fixing the value of mains and services of the gas company in a proceeding brought to declare confiscatory a rate fixed by legislative enactment.

Mr. Hyatt: I join in all those objections, may it please your Honor, and I want to again remind your Honor that this estimate in reference to the cost of pavement over mains, of course the witness has stated that he has assumed in connection with this estimate the necessity of cutting the entire pavement over all the mains and service systems, [fol. 277] and of course in that estimate I think he has added a figure here that is wholly erroneous and improper and in violation of the principle laid down in the Des Moines Gas case and also in the case involving the same company in 210 N. Y.

The Master: The objections will be overruled, and the exhibit——

The Master: Subject, of course, to being connected with the actual use or usability by the company, all these things are received. I will accept the exhibit as being some evidence of value. As to the repaving, if it were included in our general estimate of value, I would reject it, but inasmuch as it is segregated and allocated, I will accept it along with the rest of the exhibit. If it is deemed by the Court not to be material, it can easily disregard it, being entirely separate from the rest of it. If, on the other hand, the Court finds that it might be material, the evidence will be there so that it may be used. The objections therefore are overruled, and the exhibit will be received and marked Plaintiff's Exhibit 36.

Mr. Ward: Exception.

Mr. Hyatt: Exception.

(Marked Plaintiff's Exhibit 36.)

JOHN N. DUNCAN

Direct:

There is a trenching machine, very efficient in what might be called virgin territory, where you have no street water [fol. 278] services or pipes of any description in the street, but where you have those things, it is impossible to use it. I think that would be entirely impracticable at the present time, in 1923, or for many years past, in fact, to lay this system by the use of excavating machinery.

I don't know what the Brooklyn Borough Company included in their costs. The costs of the job might mean anything. If they laid pipe for what they say there, they have not expended anything for labor, or else they might have bought their pipe pre-war and are putting it in at—it must be some pipe they had on hand for ten years or more. They have $67.60 for it. They could not have bought pipe for less than $67 in 1922, much less. Those figures do not alarm me at all. If I wanted to make comparison with my figures, I would want to know more about the labor than just the report. The report itself would not be enough. I laid pipe for the Brooklyn Borough Company in 1921. I did not consult those prices when I was making up my estimate here. I mean the cost that I *laid* pipe for the Brooklyn Borough Company, because conditions were different. They were through a territory that there was nothing else in there at all. When they started to put their gas mains there, through the old race track down there, just south of Kings Highway, on the west side of the Boulevard, I don't know whether it is the old Coney Island or the Gravesend. That is, someone started to build up that territory, [fol. 279] lay out streets, and one of the first things they did was to put in gas mains. The water was no- there; the water came after we did. It was just like laying them out in the field; it was, in fact, through the fields.

The suggestion that I have not made proper allowance for doing a wholesale job as against piecemeal construction is wrong.

The practice of small jobs is we have very little watchman, very small cost of watchmen, we seldom will have a trench open, whereas if we had that whole territory dug

up the cost of maintenance and watchmen would be quite some money. We do not have that condition with the small job. My idea of that at the time I made this estimate was that one would balance the other. The cost of moving the gangs as against the cost of watching the jobs at night and Sundays and holidays and the like of that, one would balance the other. I feel that I have given proper allowance for it, also that I couls not do it any cheaper if I did the whole job.

[fol. 280] HENRY R. BURT

Direct:

Plaintiff's Exhibit 35 is a statement of the repairs which I deemed advisable to place upon the structures at 55th Street. I have also made an examination of the structures at 65th Street, with a view to determining what repairs were needed there. I listed the repairs which I observed were needed. This list was made for the same purpose for which I made the list at 55th Street, containing all of the items that I made a list of at each building, which showed the wear and tear or damage from weathering and other causes. In the office and meter room it is my opinion that there were two places where the plaster should be repaired. There was a sash that needs some paint and there was a leak in the roof. I observed all the items that I have listed on this paper—as being subjects for repair.

Mr. Grimes: I offer that paper in evidence.
Mr. Ward: No objection.

The item is the second classification, repair—"G. I." is Galvanized iron. This is the covering of galvanized iron, the covering of the pipe shed, thirty sheets of which were bent and corroded and needed replacing. And the repaint item just below that is to paint the whole covering. That involves painting the only portion that is exposed to the [fol. 281] weather. The covering had been painted before. When all of these items of repair shall have been done, then from an engineer's point of view the building would be in perfect state of repair. It would be in a condition equal to a new building. It would have the same utility of a new building, and would need no work done on it. These repairs would

be made periodically, I suppose; usually onece in two or three years. That applies also to the second classification here known as the pipe shed. In my opinion it would have the same value as a new building from the point of view of a plant. It would be new form a point of utility and every other point; it would look the same as a new building, in other words, it would keep the pipe that is stored in this shed from the elements. It is a question of maintaining the condition of the pipe which is stored on the racks in this place. I would not say it was the chief functional value. The chief value of any pipe shed includes a rack so that as the pipe is stored it is sorted in lengths and sizes convenient for the purpose of the company's business, and this rack, of course, is part of the shed. So that it is not only from the point of keeping the pipe away from the elements but keeping it sorted.

I do not know when this office and shop building was erected originally nor when the pipe shed was originally erected. As I stated before the boiler house if these repairs are made would be in a perfect state of repair in my opinion. That state of repair would exist for a period of two or three years. It might last as long as four or five years. [fol. 282] It is a brick building with a slate roof and brick walls. It is exposed and whitewashed on the interior. Wood is used in the window frames. The ridge roll is a piece of galvanized iron, of round shape, having two legs, which runs the entire length of the ridge. It covers the apex, sometimes known as the cresting. It is very usual construction, the ridge roll over and above a slate roof. The engine house is the fourth item here. The engine house is a brick building of the same construction as I have testifies to in regard to the boiler house. In fact, it is the street side of the boiler house. I do not know when that building was erected. Assuming these repairs to have been made by the plaintiff, it would be about the same period of time, two to three years before additional repairs would be necessary to the engine house. The interior wall surface is whitewash on brick, wooden frames in the windows and doors. It has a slate roof. There is a ridge roll on this roof which is a continuation of the ridge roll over the power house. I know of my own knowledge that each of these buildings about which I have just testified in connection

[fol. 283] with this proposed exhibit are used and useful in the business of making has and distributing it. My memory is that there was an engineer and a fireman in there at the time I visited the building. I think there was steam on the boiler—my memory is that there was steam on the boiler, steam pressure on the boiler. I was not instructed to determine whether or not these buildings were useful when I went to prepare my estimate.

HENRY R. BURT

Redirect:

That pipe shed protects from the weather the pipes that are stored in it. It would not necessarily protect them from theft and robbery. My memory is that it is open. It serves the purpose of being able to keep the pipes in some order by which they can be accounted for. These repairs that I have noted here are all the repairs that I noticed, and I examined the buildings for that purpose. If these repairs were made — the buildings it would be in perfect condition. None of these repairs are extraordinary repairs. They are all such repairs as would occur to a new building in the course of time. In a new building, in from three to five years usual repairs are necessary. If these repairs were made, it would be a period of three to five years before they would have to be made again.

(The above sheet was thereupon added to Plaintiff's Exhibit No. 35.)

HENRY R. BURT

Cross:

On page 11, of plaintiff's exhibit 34, the third item on that [fol. 284] page is "Haul $1.10.", I assumed that that hauling would be done by a five-ton motor truck, holding five cubic yards, and that they would make two and one-half trips per hour or twelve and one-half cubic yards, and at $3.75 for the hour, it would be equal to the cost of a cubic yard of 30 cents, plus a cost of 80 cents per cubic yard for the dump. That is, a dump ticket, that you would pay to dump it on a barge, probably dump on a barge and dump outside of Ambrose Channel.

On the preceding page, that is page 10, we have an item for scaffold, $250. I estimated using old lumber for that.

Scattered through this exhibit are other items of scaffolding in practically all the buildings. We always carry to a job a certain amount of scaffolding material which was used on other jobs, and the value of that scaffolding is practically nothing because it is part of our plant, and the cost of this amount here is merely the cost of cutting them up into the proper lengths scaffolding the side of the building, without reference to the original cost of the lumber. We have treated it on the basis of so much a side for a building, without reference to the original cost of the lumber. A side of one building of a certain length would cost so much per side to scaffold the building. The cost which we have included for scaffolding is practically what it would cost us for labor to erect it with very small increment for replacement, replacement of second-hand lumber. We lose a cer- [fol. 285] tain amount of scaffolding. We find it cost so much a side for a building, to scaffold it. This is made on that assumption.

On page 15, the fourth item that would be wood piling. We figured on removing it. This price also includes removing it. It is secondhand material. It includes the salvage; that is, we have taken the salvage out. That $6.60 then included the cost of putting in the piling and the cost of removing it. That is the salvage. That is the price that we obtained from shorers who make a specialty of that class of work, who have a price for a certain depth of sheet piling. We figured that we would sublet that piling. The quotation we receive includes the sub-contractor's profit as this does. The only other items in this exhibit are the mechanical equipment, such as plumbing and heating and wiring, which we have assumed we would sublet. Naturally, an elevator, we would have to buy from an elevator concern which would also erect it as subcontractor.

On page 20 we have an item "Elevator $2,400." That is a platform car elevator, 7 by 7; the travel is 17 feet and the capacity is three tons. We assumed that elevator would be installed by some elevator concern. The price includes profit that those sub-contractors will make on the installation of the elevator.

[fol. 286] The hardware item—we just included commission to buy the ordinary builder's hardware, such as locks and bolts and miscellaneous builder's hardware, merely

builder's hardware, bolts, locks and hinges. The sixty dollar item you refer to appears on practically every page. The doors were never in my experience furnished with door-knobs and locks, not wooden doors.

The last item on that page, "electric," is for electric wiring. It includes what is known as usual insulation. That includes the conduit, the switchboard, fixtures, necessary wire, lamps, everything from the feeding point in through the building. I do not include any power work in my estimates at all. These are merely the wirings for lighting. On page 23, the first item, "elevator $4,020" is a platform elevator 8 by 8, capacity 4 tons. It has a 10-inch diameter piston, and the travel is 26 feet. It has wood guides. Another item on that page "Plumbing" includes excavation in connection with it, and the caulking, etc., and this is in the nature of pipe protection. It includes 50 feet of hose. I have included in this exhibit all the domestic plumbing that is in the building, in all these buildings. That is the domestic fire protection plumbing. It has nothing to do with the plumbing that is required for the operation of the machinery. The same statement I made about "electric" [fol. 287] on the previous page of this exhibit applies to this page. This includes all the electric wiring, switchboards and everything for lighting. I treated "electric" the same all through this exhibit.

On page 34 there is another item "sheet piling." That is estimated the same as on the previous page. The same depth and the same price. The same unit price. The cost of handling it makes the increased price of excavation wet over the price of excavation dry. I mean a wet is much harder to shovel and throw than a dry soil. That does not include pumping. The cost varies in handling the wet soil. "Unit Price $1.50" for the one and $3 for the price of the other, per cubic yard is not entirely due to the fact that it is wet. It is a little deeper than the other. It may pass the point at which it costs more for additional staging, on account of the depth of the hole. That might just happen to pass the point of between 12 and 13 feet. I will refer to my papers and see. You see, at twelve feet, we have what is known as one stage, and anything beyond twelve feet goes into the 2-stage class, which increases the cost, whether it was wet or dry. In other words, one cubic yard of dry material at that depth would cost $2.50, one cubic yard of wet

material of 13 feet depth would cost $3.00; so the addition is only about twenty per cent., due to the fact that the material is wet. The other increase is due to the fact that you [fol. 288] pass the point where one stage is not economical and we need to use two stages. That would only apply to the last foot. It does not cost twice as much for the entire excavation. It is $3.00 per cubic yard for eighteen cubic yards. The dry portion is 316 cubic yards at $1.50. So it would not double. It only doubles it in unit. The area is just the same irrespective of depth.

On page 48, the first two items—This pavement would be laid on a sand bed, just a sand—what you call a cushion bed. Those blocks would simply be tamped in.

Page 52 is miscellaneous lengths of 7 and 8-inch pipe, including the excavation, and including bends and various other miscellaneous fittings. The entire length of the sewer buried in the ground would be approximately 310 feet. I don't know what the average depth is. There is a total of 845 cubic yards of excavation. I do not apparently have the working sheet here for that 845 cubic yards. There is 38 feet of 8-inch earthenware pipe, 25 feet of 8-inch cast iron; 85 feet of 7-inch cast iron; 170 feet of 5-inch. I have divided this into labor at fifteen days total for a gang to lay this entire pipe. It is estimated at $14 a day, two men in the gang, a man and helper. The net amount for material exclusive of contractive profit is $990. This is one of the items that I figures on sub-letting. A figure of $1,456.24 contains the sub-contractor's profit. Within that I have [fol. 289] added 6⅝ per cent for our field overhead and 10 per cent for our profit.

Page 3, the second part of my exhibit, the first and last item is heating. That includes the boiler and radiators and so forth to make up the heating plant. It is a No. 110 Kewanne smokeless boiler that cost $122 and the setting half again as much, and the rest of the item is practically piping. It would be installed by a sub-contractor, and his profit is included in that.

On the last page of my exhibit concrete pavement is principally up the driveway, runs along the rear of the building on a grade, runs up into the yard, goes by the entrance and around to the boiler room. It practically covers two sides of the building, that is, it makes a drive-

way on two sides of the building. The cobblestones, bluestone pavement is the same location, I think, is used for part of the same driveway. That is the way it occurs. The concrete is principally curbing and the center portion, especially on the grade, is the cobbles, built for horse-drawn vehicles.

I have been employed by a great many gas companies in New York City in these litigations. I have prepared similar exhibits to this in all the cases. I have testified in some of the cases before this. I knew when I prepared this exhibit that out company would not be called upon to build these buildings. The bids are prepared in exactly the same manner as we prepare bids for bidding.

[fol. 290] Contractor's bids will vary a great deal in estimating the probable cost of building a building, and sometimes they are surprisingly close. It all depends upon the project. Sometimes they are surprisingly far apart. Our company bids on a great many contracts they do not receive. We are building several camps and hospitals for the government. We bid on some other of those hospitals that we did not receive the contract. In those cases, some other contractor was lower than our company. I do not know when any of these buildings that I have set forth in this exhibit were built. The total figure that I have in this exhibit represents what in my opinion it would cost to replace all of these buildings new. They would be new buildings. Of course, these buildings are not new at this time. I think every part of a building has an indefinite life. Certain portions of it become weathered—have to be replaced. I do not mean that every part of a building has an indefinite life, and certain parts of a building have a definite life. All parts of it do not necessarily have to be replaced in time. They will last indefinitely. But the parts that would have to be replaced would have some definite life. They must be useful for a certain length of time and then they must be replaced. If half of the propective life has been used up, I would not think that part is only worth half as much as it would be in a new building. I would have to [fol. 291] know exclusively the material in question. I could not say that in general. A galvanized iron ridge roll would have longer life than a gutter, but it will have a definite life. In the case of the ridge roll, if it is kept

painted it might go from the class of having a definite life into the class of having an indefinite life. If it was kept painted its life is indefinite, but if it is not kept painted its life is definite. It would last forever if it was kept painted. They don't get less valuable, but their life is definite. If a thing will last only two years it still carries off the water. That is, its value for the use is the same. Up to the point of the time of replacing, its value would be the same. If those repairs set forth in Plaintiff's Exhibit No. 35 were made, no additional repairs would be necessary to these buildings for from three to five years. Obsolescence is the condition the building will be in when it had ceased to be of use to a company or ceased to be useful by a company. Either one might be termed as obsolescence.

[fol. 292] Brooklyn, New York, February 5th, 1924.

HENRY R. BURT

Cross:

The buildings and structures of the plaintiff at 55th Street are located along the water front. In my estimate, regarding the amount of excavation that go to make up that cost—"Excavation"—is practically the same basis, throughout, referring to the unit price of $1 per cubic yard. The labor expended in picking and digging and throwing out of the excavation the earth is figured as hand labor. I have throughout this entire plant used hand labor for the reason that the excavation is comparatively little in each location. There is not sufficient cubic yardage of excavation in each location to do it by a steam shovel or other machinery means. That is why it is figured as hand labor.

Referring to the first page of this Exhibit No. 34 of the Plaintiff—practically all of the buildings required excavation. You can determine that by looking at the first item on the first sheet of each building. The office and meter building, exhauster house, the tank house, and general storage building required excavation.

Referring to the page entitled "Kings County Lighting Company, 55th Street Station, General Summary of Cost, Structures and Appurtenances as of June 1st, 1923." I

[fol. 293] don't know of any building on there that did not require excavation. I see one here called the shavings house, which is a structure on the surface of the ground, that requires no excavation. There are one or two exceptions, but practically all of the buildings require excavation. This excavation is merely for the walls or the cellar space. Where there is a cellar, we take out the excavation for the cellar and walls, and where only walls are in a building without any cellar, we only excavate for the walls. Take page marked and numbered 1 here, excavation five feet deep, 227 yards. That refers to the walls and the cellar.

On page marked and numbered 3 "Excavation 5 feet deep, 145 cubic yards," is practically all wall excavation. There is a small amount in there far grading.

On page 5 are two items of excavation, one 29 cubic yards having a depth of 6 feet, and then there is another excavation of 16 feet, 786 cubic yards. The annotation, "Steam shovel," shows there was a larger amount of excavation. The number of yards is 786 cubic yards, where it would pay to put in a steam shovel there. You cannot get the steam shovel into the small holes that compose the balance. In cases where cellars were built under buildings, you cannot get a very big cellar in 29 cubic yards. You could not get a steam shovel into that hole.

Referring to page 7, excavation 4 feet deep, 122 cubic yards. That is hand labor. Page 9, the first item is "12 [fol. 294] feet deep, steam shovel, 1,028 cubic yards." That was a building that had a very deep cellar. It is underneath the boiler house on the harbor side. On page 35 of this same exhibit, I use a steam shovel. That is the third case, as far as I know, in which I use the steam shovel. According to my exhibit, there are only three cases in which steam shovels were used to make excavation, and for those three cases I thought it well to put in a steam shovel, bringing it there for those three special instances, and those are the only excavations which were large enough to work a steam shovel. This dirt that was excavated was hauled to the water front and a dump ticket purchased and barges sent away. That is, the excess dirt was sent away on these barges. I have included that in my estimate. I cannot tell where those barges were taken to. Some of them are

dumped beyond Ambrose Channel, and some of them are dumped wherever they require fill. In my assumption, I did not take Ambrose Channel. The dump tickets are the same price whether they only go 20 feet out into the river and dump it there, or where they go. I don't know the original grade of the property. We take as the grade, the present grade. For all that we know this entire property might have been below high water mark originally.

[fol. 295] $49.55 I have already testified is the price per thousand cubic—per thousand brick in place. That is the price of common brick. The elements that comprise that cost are the labor of putting the brick, the purchase price of brick and the cost of the mortar. I estimated the bare cost of the brick as $19 per thousand alongside plaintiff's plant. The price I assumed in my estimate was the market price of brick. We knew from several sources. As to what particular sources we used, I have no memory of a special quotation given on that date, but everybody knew in the building trades that the price was $19 alongside on June 1st, 1923. You would go to a brick dealer like John P. Kane, one of the large dealers; the prices are all the same. They are governed by the wholesale price alongside, which this $19 represents. You have to pay that plus the cartage and the dealer's profit, which is known. I did not have to go to get prices. They came to my office. I knew the price of brick. There were several bases of knowledge. The Dow Reports give the weekly price of brick. I would only have to refer to a periodical, without even getting special prices, and know the brick price of wholesale brick alongside. I have these periodicals all the time on my desk. I have them with me now. I do not remember seeing quotations of foreign brick in that record. I know that foreign brick is being delivered here in the New York market at the [fol. 296] present time. I don't know that the present charge for it is $15 per thousand. Around this period I remember the price of Belgian brick being between $25 and $26 a thousand delivered at the job. I am referring to about June 1st, 1923. That was my memory of the price of Belgian brick in May and June, $25 or $26. I do not remember the price of German brick. I do not think there were any German brick in the market then. I think German brick has only started to come in recently. Belgian

brick is Dutch brick, practically. I do not know offhand what the prices of Belgian brick are at the present time in the New York market, neither Dutch brick or German brick. They are not sufficiently low to cut the present price of common brick, which is practically the same as you see it here. The brick has not changed in price. Common North River brick is still $19, ranging between $19 and $20, at the present time, and I know of no foreign brick that has undercut that price. Since June 1st, 1923, I considered Dow's reports very reliable.

I have already testified that I visited the plaintiff's plant on Saturday, December 1st, 1923. I have not been there since then. I first visited it in July or August, 1923. About December 1st I spent the entire day there checking up these figures and quantities. I did not complete all the work involved in this exhibit on that one day. That was not the only day that I spent the entire day at plaintiff's plant. I [fol. 297] could not testify—I would have to look at the record, but I think the number of visits that I have made to the plaintiff's plant has been three. I did all the work of checking the figures on this entire exhibit on those occasions. December 1st was the only day that I spent the entire day there. I went up, I think, on the top of the office building and looked down on several roofs. I do not remember walking across a roof. You could not walk on a great many of the roofs. I observed the roofs. I determined the amount of repairs necessary on the other parts of the buildings from three or four different ways. If you find evidences of leaks, you find that on the inside, not on the top. You cannot tell whether the roof leaks by looking on the top of the roof and that is the principal item of repair of a roof. I went up in all the floors of all the buildings. I do not think I climbed to the top story where the tank is in the centre building of that roof, which is on the southerly side. I went up one ladder. I do not think I went right clean to the top. I visited the outside and inside of every building of the plaintiff. The office building of the plaintiff is just at the left of the main entrance as you enter the property. [fol. 298] I characterized it as an office and meter building, because it is called that. It is known as that throughout the plant. It has offices in it, and it is called the office and meter building. That is its name. The employees of the plaintiff

company work in that building doing office work. There were several men working in there on office work. It did not affect the cost of reproduction one way or the other. I did not see any meters in the building. I would have to look at the record to see whether I made the cost of hauling away dirt in the New York and Queens case at 50 cents a yard. I have not got any of the New York and Queens papers with me. I think that we assumed that that dirt would be distributed on the property because the property is not on the waterfront; and it was not hauled away—I think 50 cents was distributing material; but I would not be sure as to that price, because I would have to demand to see the record before saying that was the price. Assuming that that was the figure that I gave, my explanation is only that of the fact that in the New York and Queens case the land is not on the waterfront, for the difference in price. That is the first obvious reason that comes to my mind. I [fol. 299] cannot tell whether it was the controlling reason in making up that estimate or not, without looking at my estimate. I did not estimate one cubic yard of concrete floor in the New York and Queens case at $1.69 a cubic yard, $1.69 a cubic yard for concrete.

Q. I did not say "$1.69"—$10.69.

The Witness: I understood counsel to say it was $1.69.

That is the unit price I use in this exhibit per cubic yard for concrete. It may possibly have been in the other. It should be the same in each case because concrete costs the same at Flushing, Long Island as it does down near Bay Ridge. I have not the slightest recollection what my figure was in the New York & Queens case for laying 13,000 and 74/100 brick. Very likely I used the same unit price, but the quantity that I have here is 238,000 and 52/100. I would give the same price for laying this quantity of brick as I would give if I laid only 13,000 and 74/100.

The next item, 198 square yards at $2.81 per square yard was vitrified brick. Vitrified brick is a brick made out of high fire clay. It is used for pavements, any place where it is subject to wear.

Trap pits, the 8th item on the page, marked and num- [fol. 300] bered 1 under brickwork is merely a trap box or pit composed of brick and it takes 850 brick to build it. I

used the figure of $62.27 as the unit price for that work. It is different from my other work as to the unit price of work because it is taken at a slightly higher rate because you are fixing a trap, a small amount of brick to lay, that a bricklayer only lays 400 bricks per day, and that is the reason for that slight variation there, the difference between 49—$55 and $62.67. It is practically $12 a thousand difference because he only lays 400 bricks per day. We assume that in a small place of that kind he is turning so many corners, and there is so many brick. I have a recollection that the price was around $6 in the New York & Queens case for blue stone per cubic foot. There is no distinction between wholesale and retail when you buy bluestone or lay it. That is true irrespective of the quantity that you get. Assuming that I used the figure of .0623 per pound for structural steel work, there would be no difference in my unit price for larger quantities of structural steel that I would necessarily purchase in building these buildings, nor do I think there is any difference in the freight rate to get structural steel to the plaintiff's plant than to the plant of the New York & Queens. I assumed there was no difference. I obtained the price for the seven window guards shown on tenth item on page 1 of my exhibit which costs $22.52 each in the usual [fol. 301] way that I used in figuring on metal work. There are two flats which hold the round bars together. The round bars are $\frac{3}{4}$ inches in diameter and 5 feet 8 inches long, and there are five of those to each opening and two flats to each opening and the flats are 2 inches by $\frac{1}{2}$ inch by 6 feet 6 inches long, and the total weight of those are 120 pounds, multiplied by .0354, to purchase those rounds and flats, and I assumed it would take one man four hours at $1.75 an hour, that is shop labor, and labor in the field would take 2 hours at $2.25 making $18.02 which includes the purchasing of material by weight and the labor in the shop and in the field. That gives me $18.02 plus 25 per cent. for profit and overhead, which makes $22.53 apiece. Those are steel shapes; a rod and a flat. They are rolled in some way.

Register faces are just ordinary register faces that you put in a wall the same as you use in any house having a hot air furnace.

Miscellaneous bolts and plates on the wood trusses are set out. 406 pounds for which we charge fifteen cents per

pound. That is the average price for bolts and plates and that class of work. These are bolts with nuts fitted on the end, cut to length and threaded. The weight is the iron that is used in the roof trusses to hold them. I determine that 406 pounds as being the weight of miscellaneous bolts and plates on those wood trusses by the detailed list here. [fol. 302] I did not take them out and weigh them. You don't have to take anything out to weigh it to get the weight of it; you know the weight. There are some plates 6 by 12 inches by $\frac{3}{8}$ inch. You merely take your plates that are used to splice the various members of these wood trusses together and the bolts that you use. This is a built-up wood truss of lumber, and has to have this metal to hold it together. The plastes and the method of obtaining the weight of course, is very simple because you know what the weight of a $\frac{3}{8}$ inch plate is per square foot. I think I saw them. This is about the average amount of weight that would be required for such trusses. It was not an assumption on my part that there was that amount of weight, 406 pounds. [fol. 303] On this sheet I also have taken framing lumber at $95.05 per thousand foot board measure, and in my estimate of the same thing in the New York & Queens case, I took framing lumber, average 8 inches at $87.50 per thousand feet board measure. This happens to be yellow pine. That would account for the difference if in the New York & Queens case there is spruce or some other material.

If I were to build the meter house and office building at the present time, I would put plastering on bricks, plastering on wood laths and plastering on wood framing, as shown at the bottom of page 1 of Exhibit No. 34. That in my opinion is strictly up to date construction. It is being done every day in buildings of this character. Galvanized iron ventilators 12 inches in diameter and galvanized iron ventilator 9 inches in diameter are usually bought from the Globe Ventilator Company. They have regular catalog prices for those. I used the catalog price, limited by what I thought I could buy them for. You do not use the catalog price without a discount, usually. On page 2 of the exhibit is [fol. 304] shown some picture molding in the office and meter building. It is a molding near the top of the roof, the same as the molding in this room, only less elaborate, of course. It is used to hang pictures on or make a margin

or frieze above the main portion of the wall. It is used both for decoration and for utility. I haven't got any unit price for scaffolding. I used a price to scaffold the side of the building which, in my opinion, would be the price to put up a scaffold on the side of the building. There would not be any difference in the price of scaffolding for the purpose of constructing an office and meter house of the kind the plaintiff has, and a generator house of the same size and dimensions. That is, the nature of the building so far as those purposes are concerned would not make the cost of scaffolding any different. I have the cost of the plumbing in the office and meter house. It consists of water piping. There are numerous different sizes and lengths shown, 45 feet of $^{3}/_{8}$ths, 55 feet of $^{1}/_{2}$, 150 feet of $^{3}/_{4}$, 60 feet of $^{7}/_{8}$ths, with the necessary fittings and valves. Those prices also include the excavation, for the water connection and under the floor. It also consists of the lead pipe necessary for the fixtures. Two sinks, one siphon toilet, washdown toilet. It also consists of the lead pipe necessary for the fixtures, and of one sink with an integral back 18 by 24. In other words, all the items that come under plumbing for a building such [fol. 305] as this. This building has two stories and basement. I have estimated the cost of the plumbing as $1,118.89. In my estimation that is the correct reproduction cost as of June 1st, 1923. There is almost every kind of fitting that goes into the plumbing business on this plumbing work. When I say fitting in the plumbing business I mean anything that is a bend or a "T" or a nipple. It is made out of the same material as the pipe which it is on. It is various kinds of pipe. There is very little brass pipe, if any. It is mostly black pipe and cast iron pipe. I don't know whether water pipe is the cheapest kind of pipe that there is. The water pipe is usually galvanized iron and black iron, those are the usual two grades of water pipe.

In the item here of gas piping, that is the same kind of gas piping that they use for lighting fixtures. I have some recollection of one gas jet burning in the office and meter building of the plaintiff. I don't know whether it would be dangerous if it were in the meter house or not. I think that was in the front entrance near the Superintendent's office. I also have the electric lighting and equipment in this list, too. There should be gas fittings in that house because if

the electricity broke down they could use the gas. It is [fol. 306] quite usual to put gas piping in a house that is also equipped with electric lighting wires. That is quite usual in an older house. In a building used for industrial purposes, it is quite usual. I think that gas piping is used along with the electric lighting in industrial buildings. Assuming that I used in testifying in the New York and Queens case a unit for field overhead of 8.3, still I used a unit in this case of 6.58 per cent because it is a different job. The percentage of overhead would indicate here that the amount of money involved in reproducing this plant would be greater than the New York and Queens. The percentage would always be less in a larger job. In the case of field overhead, the percentage would be less. It is not any rule in this case as compared with the New York and Queens case; it is exactly what you get. In connection with any of these buildings, I have not made any computation indicating the cost per square foot of floor surface of these buildings or any of them, for the purpose of determining the value of the building. I have not made any comparison between the cost per square foot or square yard of floor surface with respect to the plaintiff's buildings and the buildings that we are now constructing, such as the veterans Hospital at Beacon or the hospital building in Bronxville. I did not use any unit price that included the hauling away of the excavation in testifying about the Williamsburg Plant in the Brooklyn Union Gas Company case. I use a separate item. I think the Williamsburg Plant and the [fol. 307] prices used here are the same. I think I have used the same unit prices in the Williamsburg Plant as to the cost of excavation and disposing of the excess earth. The Williamsburg Plant is near the waterfront. I am pretty sure that all the larger plants of the Brooklyn Union Gas Company are on some waterway, Newton Creek or Gowanus Canal. Assuming it is either Gowanus Canal or Newton Creek, of course they could not dump the earth that they had collected from the excavation at that point in Newton Creek. They would have to take it away in a barge. I got the item covering the toluol building. On Sheet 2 of my exhibit 34 I gave it that name because it looks like a toluol plant, and I built some of them during the war. It is

used as a storage building, I think. I don't remember the material that is stored in there. We have a general storage building as the fourth item on this page. In my estimate of the cost of production of the structures and appurtenances of this plant, I included therein the pier in front of the plaintiff's property. It is so noted on the bottom of that sheet, at the foot of 54th Street. I know the plaintiff uses this pier. I don't know whether they are the exclusive users of this pier. I gave the details that went into making up the window guards, I estimated the weight of those and then the amount of shop labor and then the amount of field labor. I added to that 25 per cent. for overhead and profit. [fol. 308] This was supposed to be done by some contractor. That was the same as the answers I gave the other day as to the sheet piling that I estimated. The figure given here in my estimate represents the price that I would have to pay on that line there to install that window guard in place. And to that profit I have added 6.58 per cent. for field overhead, and then to both profit and field overhead I have added 10 per cent. for my own profit. I am estimating profits on someone else's profit. Ten per cent. is the contractor's gross profit. It includes the expense of running his office and necessary expenses that a contractor would have for office help in his main office and it would include his net profit. He might very readily be busy on a half dozen jobs at the same time he was on this job. So that the office work that I have mentioned would have to be divided up among various other jobs in order to find out just what proportion this job should bear, that is, in determining the actual profit. And if he were a large and successful contractor, his estimate of that item would not necessarily be less than if he were a small contractor. As I said originally, it varies colossally with the amount of work that he has on hand. The entire 10 per cent. may be the cost of his office if he has a small amount of work. It would be a very small proportion of it if he had a large amount of work. In my experience, never less than three or four per cent. I have not made any computation to determine what the amount of profit allowed to the contractor and to the sub-[fol. 309] contractor would bear to the total reproduction cost of these structures. That is, there is a field overhead of 6.58 per cent on the total cost to reproduce, and then there

is a contractor's profit which includes the items involved in paying his office help and carrying on the business, so that together they constitute about 16.60 per cent. on the total cost of the building, added together makes that percentage, but the 6.58 per cent. is all expended on the work. Every item included in this 6.58 per cent. is expended in the field on the job. It is superintendents' salaries, watchmen, timekeepers, liability insurance, telephone, shanties, storage shanties, miscellaneous items that go to make up the proper conduct of the contract. As a matter of fact, so far as the subcontractor is concerned, he does not get a cent of it. This 6.58 per cent is not a fixed figure.

Mr. Hyatt: Exception.

This is not the fixed rule that is charged for the subcontractor on structural work. It varies anywhere between I should say 14 per cent. down to not much less than 5. The size of the job has everything to do with the percentage figure. The larger the job the less the percentage.

[fol. 310] Brooklyn, New York, February, 14th, 1924.

ALTEN S. MILLER

Direct:

I live in Baltimore and am a mechanical and consulting engineer and a contractor. I am the vice-president and a director and stockholder of the Bartlett-Hayward Company of Baltimore and I act for that company.

The Bartlett-Hayward Company is a contracting company and a manufacturing company. It has a foundry, machine shops and plate shop. A large part of its activities are in the building of gas plants, although it does a great deal of other work. It builds metal windows and piston rings and flexible couplings. I have been connected with the company between eight and nine years. It builds gas plants complete and it also builds practically every class of machinery or apparatus that goes into a gas plant, except unit running machinery such as engines, pumps, and so forth, and also it does not make the gauges and small parts that go into the plant.

During my connection with the company I have been closely in contact with that part of its business dealing with the construction of gas plants. It confines its activities in its business, extends all over the country. A large amount of work has been done by the company in Boston, New York, (It has done very little in Philadelphia)—Baltimore, Detroit, Grand Rapids, Chicago, Los Angeles and San Francisco. It manufactures gas generators. It makes the [fol. 311] Williamson and double super-heater Loub and also coal-gas generating apparatus. It has built *been* more than one-half of all the gas storage capacity in the United States and has built much more than one-half in the last eight years—all that has been built in the last eight years. I have been in close touch with that work. It takes complete contracts for complete plants, but it always sub-lets the buildings.

It is not a matter of daily occurrence, the building of a gas plant throughout, but we built two plants, two gas plants in the last four or five years, ie: Unit D. at Astoria, and a complete plant at Los Angeles, a good sized one about 20,000,000 cubic feet per day. That was built alongside the present one—additional capacity. I don't mean the distributing system.

The company is not engaged in the business of laying distributing mains or furnishing the pipe for that. We do not make pipe. We make specials, but not the pipe. We do not take contracts for laying a system of mains. Our company never has.

Eight years ago The Bartlett-Hayward Company obtained from the Russian Government a contract to make ammunition, to make some 3-inch shrapnel rounds, complete rounds, and the president of the company, who also controlled it, was a close associate of mine, a friend of mine for years, and he asked me to come along and take an interest in the company and help out building the new plant which was required to manufacture these shrapnel rounds and to organize a big operating force. We had at that time an operating force of 1,000, which we had to build up very promptly to 3,000 or 4,000, and to help out organiz- [fol. 312] ing the operating force; in other words, to put it through. I had some experience in the gas business before that time. I went into the gas business immediately

upon graduating from college in 1888, about thirty-five years ago, and I have been in touch with it one way or another ever since. That has been my principal line of endeavor every since.

I graduated from Stevens Institute of Technology in Hoboken in 1888 with a Mechanical Engineer degree. First, I went with the United Gas Improvement Company of Philadelphia. That company operated some thirty-five or forty gas plants and also was a contracting company which built gas plants and gas plant apparatus. Then after being there a few months, I was really draftsman right green out of the college, I started the way all engineers do; after being there about three or four months I was sent out to Omaha, as assistant to the superintendent, the Omaha Gas Company being owned by the United Gas Improvement Company and there I, as I say, was assistant to the superintendent and later became assistant superintendent, subject to the superintendent of course, as I was learning my way. I had charge of the construction of the new gas holder which, by the way, I had drawn up before I left Philadelphia, while I was in the drafting department, and I erected it in Omaha, also a governor house, and had charge of the running of the plant.

In 1892 to 1894, while the work was not notable, I had entire charge of the National Gas Light & Fuel Company at Chicago, which was a contracting company or really the [fol. 313] western agency of the United Gas Improvement Company, and had charge of all the work done in that territory for the last few years. They were supplying gas equipment and building plants, not purifiers, but, just water gas generating machinery. I would take a contract for certain classes of that, I would assemble the material to build, and other classes would be handled from Philadelphia. Then in 1894 I came to New York—then severing my connection with the United Company, I came to New York as engineer of the East River Gas Company, which at that time had a plant supplying a small amount of gas in Long Island City and was building a plant having a nominal capacity of 6,000,000 cubic feet a day and putting a tunnel under the East River to supply gas in New York as it was then, now the Borough of Manhattan. I completed that plant as engineer, and designed, contracted for

and completed additions to that plant bringing it up, to a capacity of about 30,000,000 cubic feet a day. I in that particular case designed everything and let the contracts and saw that the work was completed; I lived on the job and saw that the work was completed.

I had general charge of the building of the tunnel under the East River. Of course there were specialists, special tunnel engineers building that tunnel, but I had charge, as the engineer of the company, and they reported to me. That is called the Ravenswood Tunnel and goes under the center of Blackwells Island to the foot of 71st Street, New York.

I was the engineer of the East River Gas Company until [fol. 314] the consolidation and formation of the New Amsterdam Company; that is, the consolidation of the East River and Equitable, forming the New Amsterdam, and I was made engineer of the New Amsterdam, and I was in that position until 1902. About late in 1900 or early in 1901 the Consolidated Gas Company bought that property, and I was made engineer of construction of the Consolidated Gas Company, still keeping my position as engineer of the New Amsterdam. I did a very considerable amount of work, including two 5,000,000 cubic foot gas holders at 111th Street and some apparatus at 44th Street and 21st Street and 99th Street—no complete plant building, but individual parts added.

In the New Amsterdam—by the way, in the New Amsterdam and East River I had entire commercial control of Long Island City as well as the engineering control. In New York or Manhattan I laid the mains and services and set the meters, but there my duties ended, getting the gas to the outlet of the meter was the end of my duty, and then in Manhattan or New York City as it was then—but in Long Island City I had entire control and I was supposed to get the money into the bank and report to the company afterwards that it was there, available for the treasurer. I laid considerable mileage in Long Island City and I think something like fifty—between fifty and one hundred miles in Manhattan.

That brings me down to 1902. In 1902 I went to Baltimore as vice-president and manager of the Consolidated Gas Company of Baltimore. The first thing I found neces-

sary there was to build a new gas plant, which I personally [fol. 315] designed, although it was rather a simple operation, as I was given the designs which I recently made for Ravenswood and used those to a large extent, and also coordinated the distributing system so as to have one central manufacturing plant instead of three which the company had previous to that date.

After a few years that company consolidated with the electric company and I was made vice-president and manage- of the consolidated properties and I built a new electric plant and reorganized the electric department. Then in 1909 I went to St. Louis as vice-president and manager, and shortly afterwards was made president of the Union Electric Light & Power Company, which was an electric company but it had associated with it a gas company, a little gas company in the suburbs of St. Louis, so I still kept in touch with the gas business, although my main duties there were electric.

I was in St. Louis about two years. In 1911 I returned to New York, having formed a partnership with Dr. Alexander C. Humphries. Dr. Humphries had been operating under the name of Humphries & Glasgow, and we changed the name to Humphries & Miller, Glasgow having dropped out and taken the English end of the business. That was the business of consulting engineers in the operation and management of public utilities properties. That brings me up to 1915, when I went to Baltimore as I previously stated.

There is a plant down there in Long Island called the Astoria Plant. When I was the Engineer of Construction of the Consolidated Gas Company, I made the preliminary [fol. 316] layouts, the preliminary studies for the Astoria Plant; that is a plant in the Consolidated, one of the affiliated companies, now developed into a large manufacturing plant. The plant has a capacity of about 100,000,000 cubic feet a day now. It is the largest plant in the world. The Bartlett-Hayward Company supplied some the equipment there. We built most of it and have been adding to it right along. I installed some of that and had personal charge of that. That D unit I was quite close to at the time it was being built. That is the last unit; that is a complete water gas plant, having a capacity of about—I don't re-

member what they call it now, somewhere around 35,000,000 or 40,000,000 cubic feet a day. I am speaking of the D Unit. That is the last material addition to the plant, the complete water gas plant.

I was Consulting Engineer for a short while of the Brooklyn Union Gas Company, somewhere during 1901 I think it was, 1900 or 1901, and the Bartlett-Hayward Company has built most of the gas plant, I think, in Brooklyn and we are doing work here right along all of which I have been more or less in touch with. I made an inventory and appraisal of The King County Lighting Company's plant in 1917, I think it was, and studied it at that time, but at that same time we were doing some work down there, too. We put in an oil tank down there. I made an inventory and appraisal of this plant and gave testimony in the 80 cent rate case before Judge Greenbaum and before Special Master Auchinshloss in the 80-cent case this company had in the Federal Court.

Our company originally designed and built the plant [fol. 317] down there. I remember going down there and looking at it about the time it was completed. I was not connected with the Bartlett-Hayward Company at that time, but I was in Long Island City, and I remember going down there. My best recollection is that it was around 1894 or 1893, but I am not sure about it. I know I was in Long Island City at that time and I was invited with some others to come down there and see the plant, and I went down there and looked at it.

There have been a number of what we call rate cases here in New York in the last few years, involving the rates, I guess, of all the gas companies here at one time or another. I think I have been employed in every one in the last four years. I made a complete inventory and appraisal of all the properties of the Consolidated Gas Company and its associate companies, except the Consolidated itself and the Astoria Light & Power Company. We made no inventory and appraisal in that case, but we did in all the other cases, of all the other companies, and I testified regarding the Consolidated case, that being the first case with respect to the 80-cent rate, in 1919 or 1920, along there.

Also in that period, 1919 and 1920, I made an inventory or appraisal of the property of the Brooklyn Union Gas Com-

pany and all of its subsidiaries, and testified in all of those cases. In the current proceedings I have made an inventory and appraisal or am making them, of every company in Greater New York, of the property of every company in [fol. 318] Greater New York. I think there are eighteen cases pending. I have inventoried and appraised the properties of every one of those companies—all of the gas properties, in the City.

There is one company that overlaps. I am not taking the property of that company, which is not in the City of New York.

I was in Washington for about eight or nine months, during the War. I was Lieut. Colonel in the Ordnance Department of the Army, in charge of the design of cannon ammunition.

Prior to my appraisals for gas companies in connection with their suits against the 80-cent rate; going back to the time when I was in Omaha, in connection with the extensions of the distribution system, I had to make each year an estimate of the cost requirement for the coming year, in such cases laying out the amount and service extensions to be required and an estimate of the cost of those, which was sent in to the United Gas Improvement Company in Philadelphia in the form of a requisition to be approved. When the work was completed, the reports came to me from the foremen, showing the hours of labor, the rates of labor, showing the amounts of materials, and I had to assemble all of those in the form of a report showing the actual cost of the indvidual jobs.

I had to make a -reliminary estimate to go with my requisition, and then subsequently had to make up a statement of actual costs. Now, one was a preliminary estimate, one was a statement or report of actual expenditures. Either of those you can call current costs, because I was working [fol. 319] within a period of twe-ve months both in my preliminary estimate and in my report of actual costs. Subsequently I was manager of the National Gas Light & Fuel Company at Chicago which was a contracting company. In that case I had to make estimates and bids for gas plant material and apparatus, and then when we secured work, I personally kept the records, in certain classes of it, showing the actual cost and every detail, petty cash, traveling ex-

penses and everything else in the erection of that plant, and compared it with my original estimate and sent the whole work back to the United Gas Improvement Company.

Coming down to my connection—now, coming down to the time when I came to New York, I would make estimates of the cost of proposed construction in the plant or a new distribution system or of services or of new meters that we expected to get, take them to the company officers, explain the requirements, and so forth, and ask for approval of specific appropriations to get this work done. When the appropriations were approved, I would draw up the specifications and make the contracts or draw the contracts, pass them up to the company officers to actually sign them. The accounts of course in that case were kept by the company accountants, but they were reported back to me and consolidated, because I specified the names of the accounts—I mean I specified what accounts were to be kept and what was to go into each construction account that I specified. Then I would consolidate those construction accounts to the point where I thought the directors would take the time to read [fol. 320] them and report those costs back to the general manager of the company, who in turn would report them to the directors.

At a later date when I went to Baltimore as the executive of the company, I continued to make my own engineering estimates for the company board, and while I would get certain information from the company engineers and assistant engineers, nevertheless, I finally made up all the engineering estimates and I finally analyzed all actual construction costs. In that case I not only drew the specifications, but I actually made the contracts, being executive of the company. Subsequently I did a great deal of that work, because very often I make up the estimates now when we bid on large contract work. We now have out bids on over $20,000,000 worth of work, several of the estimates of which I made up myself. We are hoping to get some profit out of it. We try to get a little in.

My business was to see how much we could get. It is a question of how much you could get, and that was my business, to find out. My Chicago work included the contractor's profit. I was not doing it for the joy of life. I was there to make some profit out of the job, and it was not a ques-

tion what ought to go in, it was a question of what we could get. I got all I could. In all competitive business it is a question what you can get. I do not say always I got some, but I got a pretty good profit.

As to the distributing system, Mr. Duncan gave me his figures that he was going to testify to. I have not inventoried the distributing system, nor the pipes.

[fol. 321] I have inventoried all of the equipment that is being used by the company, all of the property of the company other than the buildings and the distributing system, the buildings and the meters; certain items, though, I have taken from the books of the company. I have not included Real Estate in my estimate.

There are a number of gas-making machines consisting of certain water gas machinery, with the necessary blowers and boilers, the coal unloading and handling equipment; then the necessary scrubbers, condensers, purifiers for the gas, meters for measuring it—that is the works meters—and the holders to store the gas, from which the gas goes out through governors. I am speaking of the two governors at the works now, two at the 55th Street manufacturing plant. There are some oil storage tanks there too. In the mains I have mentioned the equipment that makes the gas, which are the principal items of equipment; there is also equipment to bring in the oil and the coal and store both of them and to handle them. And there is the gas-making machine, in this case water gas machines. There are boilers for furnishing the steam. Large quantities of steam are needed.

The gas that is made in the generators has to be treated in a certain way—it has to have the tar and vapor removed and then has to have the sulphur removed. It is first condensed, as it passes through the scrubbers. The purifiers take out the sulphur and then it is metered and then it goes into the holder, at 65th Street. There is one holder that the gas goes into before it goes through the purifiers, that is [fol. 322] called the relief holder. By having that holder between the gas generating apparatus and the purifiers it enables the gas to be purified uniformly, although it is made intermittently. The very process makes the gas intermittently and it is purified uniformly. By using the relief holder it is possible to use smaller purifiers.

The company makes what is called carbureted water gas. There is coal gas and oil gas. The principal kind is coal gas, in this part of the country. The West Coast makes oil gas altogether. We do not have either an oil gas plant or a coal gas plant, it is a carbureted water gas plant and that requires oil in its making in quite substantial quantities. I found the equipment there for storing the oil and for transmitting it to the generators. Those are what are called the oil tanks for storage and pumps for sending it to the generators and the blowers for furnishing the air. That is in the process of making the gas. They furnish the air to blow up the fires, heating the fires.

I took the building just as summarized by Mr. Burt in my summary sheet, but I made an inventory and I examined them all. I made an exact count of every unit of apparatus included in my appraisal, except such items as I took from the company's books, which I checked up sufficient to verify. I took this as of June 1st, 1923.

As far as other items or units listed here are concerned, the list was primarily made up by my associates, and then taken by me and checked in detail, every unit. By my associates, I mean that I had a staff of engineers on this work, more or less experienced men. They know a gas [fol. 323] plant better than anything else. They are trained engineers who have been in this work with me for a good many years. They have a system and orderly way of arranging things on paper. The inventory is arranged by buildings. Instead of by the system of accounts, it is arranged by buildings; so you go right into a building and the units specified will be found in that building. They listed them and I went down and checked them off item by item and I did that as to everything that was there. I made several visits there.

Before starting at all, I took two of my principal men and went down and went through the plant, looked it all over together and had conferences as to methods, et cetera, and then later they started in and we went through it again several times, and as questions would come up regarding it we would go down and look over any item we were doubtful about. I found equipment there that had been furnished by our company. The generating machine that I have spoken about, and some other things. I then went out to the holder

station. There are some governors, and to the best of my recollection there are exhausters out there. There is a booster out there, or exhauster. There are two holders out there, one 2,000,000 cubic feet holder, and a half million cubic foot holder, I think. The two million is a Bartlett-Hayward Holder. I am not sure whether that half million is; my recollection is it is. I did not build it though. I was not personally connected with the Bartlett-Hayward Company when either of those two were built, but my recollection is that—I am not sure whether that half million was [fol. 324] built by Bartlett-Hayward or not, I do not recall.

Across the street there from the holder is the shop building. There is quite a lot of material in that shop building. The meters are kept there, whatever meters they have in stock, but, I did not have anything to do with the meters in stock. That is, I did not count them and am not responsible for those figures. I took Mr. Gonmond's figures for those. I determined the cost of installing this part of the plant and of the entire plant, but first I appraised my own inventory. My own inventory is a book that I have before me.

Mr. Moran: I will have it marked for identification, with the Master's permission.

(Inventory marked Plaintiff's Exhibit No. 39 for identification.)

On the page succeeding Page G is a summary. I have divided it there into the equipment in the artesian well-house. That includes all the equipment I found in the artesian well-house and the well too. There is an artesian well there. Then I have the boiler house basement and following that I have the boiler house. The boiler house would include all the boilers. Those are the principal items in the boilerhouse and following that I have the engine-house. Right alongside of the boiler-house was largely exhausters and boosters. The boosters are the things that force the gas out to the large holders out on 65th Street. It is listed [fol. 325] as an exhauster here. It is the same thing. It is the exhauster that pumps the gas away from the works, and the generator house—there are two generator houses, one is No. 1 and one is No. 2. They are labelled there so that those numbers appear. Those numbers are commonly

called by the Company Generator House 1 and 2, that is my recollection. They have been called Generator House No. 1 and No. 2 by Mr. Burt also in his testimony. Those two houses would include the gas-making sets and the hoists in the house on the dock are hoisting machinery. The meter building, I think Mr. Burt called it, is at the works. The meters are partially in the cellar and partially on the first floor. Those are the meters that measure the output of the gas into the works holders, into the storage holders. That is, they have nothing to do with measuring gas used by consumers at all—just the measurement of the gas made; and in the oil pump houses, there is a pump necessary to pump the oil through the works there from one place to another.

The purifying house covers the purifying apparatus for taking sulphur out of the gas. You won't find piping in that, but the shaving scrubbers and the holders and condensers. Piping is grouped. I group piping separately, small piping and large piping. Oil pipes will also be found under that. A chimney is included in the yard; that, is listed at the yard. Our company builds a great many steel [fol. 326] chimneys—no brick. There are several companies who put up radial brick chimneys of this type. At the holder station which I call the 65th Street Station, we have a boiler-house out there and an engine house. We have a yard out there that includes the holders themselves and we have some piping there also. I have given here some figures on this page, and they are my prices as I call it, on my equipment that I inventoried. That is the price on our labor and material on a sub-contract basis.

On the pages succeeding these is the detail of that and contains an accurate count of units and dimensions. I have adequately described each one of them so that an engineer, at least, could identify the machinery if he went down there. I have described it in the usual way that it is described. For instance, boilers, I tell the number of tubes they have and the length and so forth, generator sets, just the type. The number of them is contained in that and a price for each one.

In reaching a value of the whole plant, I have used this figure that I have put on the equipment, for one thing and I have used the real estate men's estimate of the land—Mr. Burt's estimate of the buildings—Mr. Duncan's estimate

of the distributing system—Mr. Gonnoud's of the meters. Mr. Gonnoud did not tell anything about installing meters. I have the cost of installing the number of meters which there was in service at May 1st, 1921. I included installation of the number of meters that were installed at that time and none after that time. I understand the company [fol. 327] did not stand the expense of installing since that time. Anyway that is what went on. I have installed large numbers of meters. I am familiar with the cost of installing them. I put a price on installing meters. It was $6.50 per meter, on the average.

The work I have included in the installation is taking the meter from the company's storeroom, carrying it out to the place of installation and running the pipe connection from the end of the service to the meter, and from the meter to the house riser, examining all of the connections in the house before the meter is set, to be sure that there are no openings where there would be a leak of gas, then setting the meter, turning on the gas, first checking to see that there is no gas passing through the meter, then going through the house, running the air out of the pipe in the house and then checking up and seeing that there are no leaks and everything is tight, and making the report and going on to the next job. That is the general work I mean by installation.

I mean by installing the pipe at the end of the service, the end of the service is a T that is put on immediately after you come through the wall, that is the end of the service. That is the point at which I began in my estimate here the cost of establishing the service. That is at the end of the pipe coming in from the main in the street into the consumer's premises. Take an ordinary cellar, it usually comes in pretty well towards the floor of the cellar and stops there. The house riser will be found near the ceiling of the cellar, it won't come clear down. It may not be directly [fol. 328] over it, either, it rarely ever is. I do not believe you would need quite as much as eight or ten feet of pipe in each instance to bring the two together, but anywhere from four to eight feet. The whole distance between the end of the riser and the end of the service has got to be bridged except that occupied by the meter and of course you go above the meter and come do*wn* in, and then you

rise out of the meter and keep on up. The intake and outgo pipe from the meter are both from the top and quite a number of fittings are needed in connection with those.

If you turn to page 61, I think it is between 61 and 62 just before 62, I have there meters on district, a figure which is already in the case and meters in storeroom, that is already in the case. The figure following meter installation, is the figure that I am supplying. You will find that on page 64. It is for 40,747 meters. That is the testimony of Mr. Gonnoud, and it is the number that was on at that time and that is at the rate of $6.50 a meter.

In the distributing system, that is the only item that I have as a direct cost. Meters I got from Mr. Gonnoud, services and mains from Mr. Duncan. I brought together everything the company has in use out there, as of June 1st, 1923. I took the books for tools, etc. a very large number of small units. They are just not worth the expense, the time required is so great for the tools and small equipment that I have taken the book accounts. Take the sheet [fol. 329] following my index, I have there general equipment including office, shop, store, stable equipment; that is shown by the books of the company. That is what I referred to. I follow that with certain titles like G-122-A and G-122-B, and so forth. Those are the number of the accounts under the Uniform System of Accounts, which were in use on June 1st, 1923.

The company has book accounts of that character and these are the amounts carried on its books, this amount I have given here is the amount carried on its books for that class of property at that time; that is $97,825, and the following entry there I have Tools and Implements as shown by the books of the Company, 237—that is the number of the account too, that is the number of the account for Tools and Implements $4,716.01. Those are the only two I resorted to the books of the company for, I mean so far as inventories and prices are concerned.

The next item there that I have is Omissions and Contingencies. That is intended to cover two classes of items. The appraisal is made on the basis of the lowest market price of every item in the appraisal. In making an inventory it is substantially impossible to find everything in the plant. During the construction of a plant units of ma-

terial are lost and broken and there are delays due to weather; there are interferences between various contractors which cause delays and expense. It is impossible to get everything delivered at the exact time at which it is required, at the lowest market price, and yet everything must co-ordinate in order to complete the property in time. [fol. 330] Omissions and Contingencies is an allowance which we find in practice is necessary to make over and above the cost of the individual units to be found in the property, and this allowance which I have made is an allowance of five per cent on such equipment as I have furnished myself in the appraisal, in the item $1,514,563.

That "Omissions and Contingencies" is applicable solely to my own appraisal. It does not include anything on meters, on mains, on services or buildings or land.

I have here Engineering Superintendence and General Contractor's Expense and Profit. The Engineering covers the design, the general design of the plant, the detailed construction drawings, the layout of the Distributing System, determination of sizes of mains and of services, and it covers the specifications for the plant, including the buildings and such general supervision as is necessary to ensure that the work is being reasonably done according to the drawings and specifications.

The Contractor's Expense and Profit includes the amount paid to the contractor for assembling all of the sub-contractors that may be on the work, for the assembling of labor and material for the work being immediately done by the general contractor, and for assembling the material on the job, for co-ordinating all of the construction work, so that it may be done at the unit prices set forth here and in the time required by the plan. I have not included the [fol. 331] contractor's profit on the distributing system. There is no profit to the general contractor on any part of the distributing system. The general contractor's profit is on the buildings. The buildings will be sub-let to a building contractor by the general contractor, just as we built the unit in Astoria.

Looking at the page following the index, which is a general summary of the whole plant, immediately following that I have a page which shows the makeup of each one of these and the percentages, etc. that is a copy of my work

sheet. It shows the makeup of each one of them. I have there for this item that we are talking about $577,148 and I find the makeup of that item on the next page, showing how it is made up or distributed.

I have here Interest During Construction, on the General Summary Sheet. For the purposes of computing these undistributed overheads and expenses I have taken a period of two years for the construction of this property. The organization and development, of course, would occur prior to construction and the land would have to be paid before construction begins, so interest is computed on those costs for two years. On the construction items themselves there would be no payment at the start and they would gradually work up to the maximum at the end of two years; so I have taken it for half of a two-year period, in every case the interest being computed at eight per cent. That is shown on [fol. 332] my work sheet. The interest computation will be found in two places, one on Organization and Development, near the bottom, and the interest on the other two items about one-third of the way down. The taxes are computed on the land for a period of two years and on the improvements for six months, the amount of taxes being the actual taxes on the land for 1923 and one-half the taxes on improvements in 1923.

I have another item for Administration, Legal and Miscellaneous General Expenses During Construction; That item covers the company organization during the construction period. It would, of course, cover the accountants, auditors, and some of the timekeeping and inspection—that is, sufficient for the company organization to know that it is getting what it is paying for.

In my experience in building plants as a whole I have been met face to face with these expenditures or like expenditures continuously, other than for preliminary organization. That is something you do not meet with continuously. But outside of preliminary organization, every one of these expenses are continuous. I mean I have met with them myself and have been obliged to cope with them, if I might use that delicate term. I am doing it and still do. I have paid them. I have made the payment and audited vouchers for such expenses in my experience. These figures I have given here are the result of my experience

and my judgment as to what it would be necessary to incur in reproducing this plant.

Just what I have testified and what is contained in this [fol. 333] book here, Plaintiff's Exhibit No. 39 for Indentification. I have down below that Working Capital, $855,-227. That is the cash accounts receivable, the prepaid accounts, gas supplied but not billed. Of course there are the materials and supplies. The company has got to have some coal and oil on hand, all of the times, those are included in the materials and supplies. We have an investment in that. A company as large as this must have ahead a substantial amount of coal to guard against accidents.

During the autumn months or during any time when there is likely to be labor trouble and they are running into a shortage of coal, a company ought to have ninety-days' supply of coal. The same thing would apply to coke and coal. Coke and anthracite coal are used interchangeably for generator fuel for generating gas. Generally coal under the boilers, with such screenings of coke as are not properly usable in the generating apparatus. Now, the facilities for oil delivery around New York Harbor are very good, and as a rule few, if any, of the companies carry over three or four weeks supply of oil. It is a good idea generally to keep three or four weeks supply ahead, because you never know when something may happen. Then there is a certain amount of repair material which must be continually carried, small piping and waste, and various kinds of packing, various kinds of material to keep the plant going, including the repair parts. Sometimes the repair parts are charged directly into the account, sometimes charged into the store-[fol. 334] room. I do not know just how this company carries them. If they are charged directly to repairs they do not show here. Then there is a certain amount of material that must be carried all the time, too. If there are unusual demands for quick extensions of the Distribution System, there should be service material, reasonable amounts of main material. Then in addition the company has to prepay its accounts from time to time—taxes, insurances; particularly insurance. Then there are also periods, quite a definite period, between the time the company supplies the gas and the time the meters are read, and it is entered on the ledger and becomes an account receivable. Neverthe-

less, labor must be paid for, and oil and materials paid for to make and supply that gas. That would not be reflected in the company's books as an account receivable until it is billed.

I do not think it would ever be reflected in your books, because I do not think you ever show it. It has gone into your expenses. It does not show as an asset in any way, that is what I want to bring out. But the gas that has been consumed and billed but not yet paid for shows as an account receivable and a company the size of ours would always have quite a lot of that.

This company reads its meters once a month. That is quite customary for gas companies in this district. The British companies usually read quarterly. The Philadelphia reads quarterly. Assuming that they read monthly, it appears to me some gas would be made and used at least thirty days before it appears as an account receivable. Some would be about 34 or 35 days, because it takes four [fol. 335] or five days from the period when the meter is read until the time when it is entered on the ledgers as an account receivable. So if it is read on the last day of the month the gas used from the first of the next month to the last day would make 30 or 31, days, then plus that period the lapse would be 34 or 35 days. But the average number, of course, would not be that, because the average would be only out zero days. I mean the last day would only be out zero plus four or five days. A general average of fifteen or twenty days. The average of fifteen plus five days, to get it on the ledger. About twenty days. The accounts receivable represent an investment in labor and material that has gone into the making of the gas all except whatever profit there may be. I mentioned cash there in connection with working capital. I have referred to cash. The company needs a certain amount of cash in bank for various reasons; for one thing, in order to keep their credit good with banks and to be able to get money when it needs it again; in order to discount bills, pay them promptly.

The cash is also the reservoir into which and from which these other accounts flow. The coal supplies will be generally—coal and oil will generally be larger in the fall and smaller in the spring. There is one other account I did not mention in material and supplies; that is the appliance ac-

count, but your company does — have any appliance business, so that would not affect you; but the coal and oil would be larger in the fall and smaller in the spring. Your service [fol. 336] and main material will generally be larger in the spring and smaller in the fall, and getting into the late summer your accounts receivable will be smaller in the spring and summer. Generally speaking, the cash will be larger in the late spring and summer, and smaller in the early winter. Cash being the reservoir into and out of which these various accounts flow, but always cash is necessary in the prompt payment of bills, we will say. It is also necessary for the company's credit. The figure of $855,227 is the average of the actual amount during the year 1923, the average balance at the end of the month of this company on these particular items I mention. I had twelve months showing the balance of accounts receivable and I have taken the average of cash and the average of materials and supplies, average prepaid accounts.

I consulted the company's records for that, to find out how much gas the company made last year, the volume of business it did. The total amount of working capital that would be necessary, I believe that if the company were crowded they could work with a little less. I think this amount is reasonably necessary, regardless of what was on the books. I am influenced in that by the amount of business they did and the people they are doing business with. With respect to that, in order to form a judgment as to the reasonable requirements of working capital the territory in which they are working is a rapidly growing territory, which requires large capital expenditures, and therefore the company had to have on hand a somewhat larger amount of [fol. 337] working capital, in order to be ready to make extensions, than a company would in a territory that was not rapidly growing. The figures I have given on my general summary sheet here, the total represents my opinion of the value of this property, assuming that the value of the land is as given by the witnesses, and the distributing system and other things, assuming the correctness of the figures which I have taken from other witnesses on that assumption, this represents my opinion of the value of the property as of June 1st, 1923, including working capital.

I have a note here that I exclude going value and franchises. I have some pages numbered A, B, C, D, E, F and G, being those same things, substantially the same, as I have testified to; much more carefully worded. These written pages reflect the testimony I intend to give with respect to these subjects.

MILLER

Preliminary cross:

Referring to General Summary Sheet, on Exhibit No. 39 of the Plaintiff marked for identification entitled, "Inventory and Appraisal of Property of the Kings County Lighting Company as of June 1st, 1923," I said that it would take at least two years to complete the work that I have estimated here and install the property on which I have given the figures with relation to their value and it would probably take longer. That assumes on my part that the land is there and graded in the condition in which I found it as [fol. 338] about June 1st, 1923. I have given the value here of buildings, or at least taken the value of buildings constructed or appraised by Mr. Burt as of June, 1st, 1923.

I said that if the contractor was not interferred with, the buildings might be put up in six or eight months but he would be interefrred with and it would probably take approximately two years before he got through. In other words, while I was installing the equipment and property that I have indicated on this exhibit marked for identification No. 39, the construction of the buildings would be going on at the same time. I am not aware that Mr. Burt estimated that it would require, for the completion of the buildings, one year. That would not in the slightest way, if I were assured of that fact, effect my conclusion on this page. Mr. Burt assumed that he was not going to be interfered with. I know we would interfere with him in putting up this plant.

I assume that at the time these buildings were reproduced and this equipment was being installed about which I have spoken, the Street Mains were being laid in the district in which the plaintiff does business. The approximate number of consumers is 50,717, on June 1st. I do not think I have the number of services it had on June 1st. The num-

ber of meters it had on June 1st, 1923 is about, 53,038. During this period of construction there might be approximately 53,000 consumers awaiting a supply of gas, during this entire two years, but the meters would not be waiting. [fol. 339] The consumers during this entire two years, under my method of estimating the reproduction cost of this property, would not be waiting for service. They would not wait at all so far as I know. I have simply taken the costs as of June 1st, and I have taken the period of two years for the purpose of computing the overheads, undistributed structural costs and I have not assumed that any one would wait or that the plant would be actually reproduced.

I have in here coal and oil and materials on hand for the purpose of serving consumers, and also repair materials, none of which is needed until consumers are actually requiring gas. So that, my particular working capital estimated it would not at all be necessary or called for during those two years of construction, so that the inclusion of the working capital is something that does not necessarily have any connection with my reproduction cost of this property. You have working capital no matter how you found the value of the property, the working capital would be there just the same. You would need the working capital during this period of construction but you would not need that particular working capital you would probably need more.

When these buildings were completed and this equipment was installed, and the land was graded and the plant [fol. 340] was ready for service, of course it would be an entirely new plant.

I mean by cost of financing, the amount that it would cost the company for the preparation of the prospectus, the mortgages, if any*m* or whatever form of obligation was issued, whether it was stock or bonds, covering printing and so forth, and also the amount that would be paid the underwriters or bankers for placing the stocks or bonds or whatever obligation was issued.

As to interest during construction, that is interest at 8 per cent. for two years. It is interest on $8,581,528 at 8 per cent. for one year, and on $994,002 at 8 per cent. f[illegible] two years. This item of $8,000,000 that I figured there,

$8,000,000 plus is all shown on the work sheet. The work sheet immediately follows the general summary. In other words there was $8,000,000 worth of property which this company had at the end of two years, on which an 8 per cent. return had to be paid, not for the period of two years, but at the end of two years. In other words, it did not have the $8,000,000 during all the two years. It was accumulated from the beginning of the construction period up to the end of the two years. In other words, it was not a continuous [fol. 341] figure on which the 8 per cent. was paid during the entire period, it was a growing figure, beginning at nothing and ending with $8,581,528. In my computation, I have not assumed it was continuous.

With respect to taxes during construction, $64,639; taxes assessed at the regular rates prevailing during the year 1923, for certain property were used by me in my figures. The land was there for at least one year and more, and the buildings were there continuously; six months according to the taxes.

The items of property on which I paid taxes was on Real Estate, Land and Improvements. I didn't have any personal taxes included in this estimate. This method that I have used here is generally known as an estimate of cost based on reproduction new. I am speaking of everything except working capital—all plaintiff's property as of June 1st, 1923 would include working capital.

MILLER

Direct:

I noted the condition of this property very carefully. The property was well maintained and operating efficiently. I found no repairs that were immediately needed other than such as the ordinary repairs that were regularly going on, replacing the checker brick, painting, and so forth. I have made a memorandum of whatever would be necessary to put the property in the condition in which it was when new. That is, of the items that I inventoried, not of the building or anything of that sort. I have that on paper. I produce here a folder with the details of that on.

[fol. 342] (Marked Plaintiff's Exhibit No. 40 for identification.)

This Plaintiff's Exhibit No. 40 for Identification lists all the items of property which I inventoried, on which expenditures might be made to bring them up into the condition in which they were when new. I saw some brick that would have to be pointed up, if it was put in the condition it was in when new, but they did not need pointing up. I am speaking about bricks in the building.

I have dealt with only such items of equipment as I inventoried and on which, in order to restore them to the condition which would make them in the condition they were when new, some work would be necessary, and I estimated the cost of that work, both at the 55th Street plant and at the holder station and I have it on this Plaintiff's Exhibit No. 40 for Identification. The meters are regularly being overhauled. I know meters, I have had a lot to do with meters. They do need attention from time to time, in the way of repairs.

Meters are brought in and tested, and if they test as true, the hands are set back zero and the tops put back, and they are sent out on the District. If they have been in use for some time the diaphrams are usually oiled and the valves cleaned, and they are put back. Occasionally sometimes they put on a new dial perhaps. Sometimes they have to regrind the valves. By the rule of the Public Service Commission they must come in every seven years anyhow. Of course, they come in oftener, because when there is a change of tenants they frequently bring them in. [fol. 343] But they must come in every seven years for complete overhauling. That is according to the Commission's system here. The customary period, I think, is pretty general, about seven years. They are so constructed that if they are properly overhauled periodically like that, they keep in fairly good condition, as good as new. The meters are the very essence of the company's business. They must be kept in good condition. They are made in different parts so the diaphragm can be taken out and a new one put in and any one of the parts can be removed and a new one put in.

I have had experience with cast iron gas mains all my life. There is no limit to their durability. They do not rust out, or anything of that sort. Gas passing through them does not corrode them or wear them out in any way.

Cast iron mains are not coated on the inside when they are put down—not for gas purposes, they are not coated, just the cast iron smooth, just as it comes from the casting pit. Except that the fins are chipped off and sand rubbed down, but just a smooth cast surface, without coating. I have seen them removed after many years in service. They show no effect of wear on the inside nor outside. They are not coated on the outside just the milled surface, the foundry surface and they do not rust. There are certain soils that will coat them about an inch thick. In other soils they will have no coating at all. There is some little iron outside that goes into that soil and makes that coating, but in other soils they do not have any coating; but the soil that does make that coating, after the coating is made there is no deterioration.

[fol. 344] To keep the mains in shape from year to year, depends more on your neighbors than anything inherent in the mains. Under any City conditions there is always a lot of digging, always more or less digging and interference in the streets by sewers and water pipes and electrical conduits, and it requires constant attention in maintenance to keep mains in line due to such interference—to be sure they are properly protected and left in good shape. Then where the streets are graded and the streets are being graded more or less regularly you have to move your pipes to conform to new grades. In some cases if the filling is too great, abandon them altogether. But there is nothing required to take care of a main system where it is not subject to outside interference.

In the expenses for 1923 I notice an item there of repairs to mains. Outside interferences compel you to repair mains. The joints will get loose if they let them sag. If they sag enough due to sliding over on to a trench done alongside, they might have re-caulking then. In that case they would.

As to services, sometimes where they go through an open cellar or an open areaway there is some little corrosion. Of course, if there is any electrolysis there will be service corrosion. The service pipes are made of wrought iron or steel. But outside of electrolysis or open areaways, there is no corrosion in this soil which we have here. I am speaking of the services now. In some soils they will cor-

rode and it requires very great care. The gas does not [fol. 345] have any injurious effect upon the service pipe any more than it has an effect on the cast iron pipe.

Your displacement meter needs painting from time to time. That is for ornamental effect, though, and not for preservation. But your mechanical meter, that is your Thomas meter has moving parts, moving parts and bearings, etc., which must be oiled, and probably at very long intervals you will need new bearings in your little motors that operate it.

The holders need painting about every two years, with varying regularity. Of the holder itself, the guide frame—well, I should say you ought to paint your guide frame down there every three years. It varies very much in different parts of the country. Around in the Metropolitan district where they are subject to the salt water breezes, iron and steel require more paint than back in the dry interior.

The interior of the holder is not affected by the gas at all. If it tended to be affected by anything else, the gas would preserve it, because there is a certain amount of condensation of oil on the interior which would preserve steel, of which the holder is built, against any corrosive material—if it were subject to that, which of course it is not. We do not get much business replacing holders. We have replaced one holder in the Metropolitan District which was designed too light, and the strain was too great for it. That was bad design. Although it was just as good practically, when we replaced it as it was when it went up. But it was bad when it went up.

[fol. 346] Speaking of holders I am prepared to say this company has adequate holder capacity. I mean by that I have studied the situation a bit. I know the capacity of storage holders, this company has. I have already given it.

I know all the facts about this company that would enable me to express an opinion one way or another on all the facts you are asking me. I have them. The facts that I must know in order to tell you this are: the maximum sent out and the method of manufacture. It is a water gas plant, which requires somewhat less holder capacity in proportion to the maximum send out than a coal gas plant.

The company in the case of a water gas plant should have at least in holder capacity two thirds of the maximum day's sent out. The plaintiff company has five and a half millions.

My company has made a contract to put in a new 5,000,000 cubic foot holder at the 65th Street Station. It is to be put in just as soon as it reasonably can be. It will go in sometime during this year. Ordinarily when the holder capacity drops below about two-thirds of the maximum days, the time has come to make additions. When you make additions, the question arises whether to put in a small holder giving just the exact amount required, or to put in a large holder, which costs less per thousand feet of storage capacity. The difference in cost per thousand feet of storage capacity might be considered in connection with the rate of growth of the business and, incidentally, in connection with the amount of money the company may happen to [fol. 347] have and be able to pay out, what its financial position is. Ordinarily it is customary to provide from three to four years in advance, so that you do not have to build holders oftener than every three or four years anyhow, sometimes farther in advance than that, always keeping in mind that the larger the holder the less the cost per thousand cubic feet of storage capacity. For instance, a million cubic foot holder costs about $120 per thousand cubic feet of storage capacity, and a five million holder costs only $80 or $90, I forget the exact figure, so that there is a rather rapidly reducing scale and it is generally customary to figure about four or five years; and at the rate of growth of this company I do not think—I am sure that this five million will not last longer than four or five years, and I doubt whether it will last that long. It is an absolutely economical thing to do at the present time.

[fol. 348] ANDREW J. GONNOUD

Direct:

I gave my occupation as accountant. I have been with the Company, in charge of its accounting, since January 1st, 1919. I was connected with it before that time, in the capacity of auditor, I did the auditing there from June,

1918. I went into its employ January 1st, 1919. I was acting auditor from January 1st, 1919 until August, when I was made assistant secretary. I am secretary of the company now. I was assistant secretary from August 1919 until November, 1920, when I became Secretary, and have held that office ever since.

My experience in the accounting line before I went with the company is already on the record. I have given that before. I now concern myself particularly with the company's accounts and records. I have full charge of all the company's accounts and records and supervision over all the records of the company. I have a particular system of bookkeeping and accounting. The system of bookkeeping and accounting is conducted under the Uniform System of Accounts as prescribed by the Public Service Commission of the State of New York, for gas corporations. It was originally promulgated in 1908. This pamphlet that I have here contains that system of accounts. This is a pamphlet issued by the Public Service Commission, which also includes the final order and modifying order in Case No. 578. That just modifies the System of Accounts. That is what has been furnished to my company by the Public Service Commission to regulate its accounting together with the proper order. I believe the order is contained in this book under case No. 579.

[fol. 349] (The document was received in evidence and marked Plaintiff's Exhibit No. 41.)

My books are kept on a yearly basis. In other words, the year is my accounting period and it is the calendar year. The last full calendar year or accounting period ended December 31st, 1923.

I have charge of all the books that keep account of expenses of operation and the capital expenditures as well. I have closed my books for the year 1923 and when I say "Closed my books," I mean I have closed the accounts which show the expenses incurred by the company in making gas under its several accounts during the past year. I have taken a transcript or correct copy of the expenses incurred by the company as shown by my books. What I have before me is such a copy.

(Marked Plaintiff's Exhibit No. 42 for Identification.)

I have the books which carry these accounts shown in this statement. I have here the complete set of the general books of the company, general books and subsidiary general ledgers, the summary books and trial balance book. These are comprised of the general ledger of the Kings County Lighting Company, known as Ledger No. 6, containing the general accounts of the company for the year 1923, including the general accounts on the fixed capital and the expense accounts and corporate accounts. I mean by that the account showing the expenses incurred in the operations of the Company. Other accounts I said are the fixed capital accounts and the corporate accounts. The general ledger shows the balance as of the 1st of the year, the expenditures during the year and the amount at the close of the year. [fol. 350] The book here has just the accounts, fixed capital prior to 1908 and fixed capital after 1908. It has in general headings operating expenses. Turn to a sheet, for instance "Production Expenses." Here it is (indicating). This carries the amounts for each month and it is totalled up at the close of the year, the balance at the close of the year.

(The book was thereupon marked Plaintiff's Exhibit No. 43 for Identification.)

Besides the General Ledger, I have what I call Subsidiary Ledgers. Take one of them, for instance, contains the details of the general account as kept in the General Ledger, all those accounts that need details. Some of these general accounts do not need details and they are not kept that way. Some of the general accounts don't need any details.

In the expense account they are detailed to show the items as carried—detailed in such manner as prescribed by the Public Service Commission, as prescribed by the uniform system of accounts. For instance, the subsidiary ledger contains for "Production Expenses," a separate account for each thing that goes into production expense, you might say. A separate sub-account for the items shown on this Exhibit No. 42 for Identification. For instance, Plaintiff's Exhibit No. 42 for Identification now contains the sub-divisions of the production expenses there. They can be found in this subsidiary ledger I have just produced here.

(The Book was thereupon marked Plaintiff's Exhibit No. 44 for Identification.)

[fol. 351] The General Ledger and Subsidiary Ledger which has just been marked for identification contain all the information contained in Plaintiff's Exhibit No. 42.

Next we have two Summary Books here, which summarize the information as shown in this detailed ledger, and then there is a summary made up of this into another form. These summaries are used in order to be able to produce our monthly reports with greater facility and to tie in the sub-account shown here with the general ledgers. The technical title of those summary books is summary ledgers, you might call them; subsidiary summary ledgers. An accountant in tracing these things, would use those books to facilitate his checking. They are just for the year 1923. There are two of them. I call them Subsidiary summary ledgers. One takes up where the other leaves off. That is a greater summary than this is (indicating). That is, this carries more detail than the next summary, and then we carry those monthly, and accumulate them for elapsed months. Detailed summary and general summary, is the way to distinguish those for the record, by title.

(The books referred to were thereupon marked Plaintiff's Exhibits Nos 45 and 46.)

The first one, Plaintiff's Exhibit No. 45 for Identification, is the detailed summary, and the other one, Plaintiff's Exhibit No. 46 for Identification, is the general summary. Then we have this trial balance here. That is no part of the general ledgers, but it indicates whether there is a balance in the general ledger. It is a tabulation taken from [fol. 352] the general ledger, and it is used in connection with the general books, that is for the year 1923.

(The book referred to was thereupon marked Plaintiff's Exhibit No. 47 for Identification.)

Next we have the Journal entries for 1923, only.

(The book was thereupon marked Plaintiff's Exhibit No. 48 for identification.)

These books that I have produced here and that have been marked for Identification, have come from the offices of the company this morning. They are the books kept regularly from day to day, and kept under my supervision and direction.

We have not completed the report of our operations for the year 1923, for filing with the Public Service Commission, as yet. It is being prepared now from these books. They ask for more information than obtained in these books; statistical information. I have been with the company for five years and I have gained some practical experience, besides an accountant. I am some sort of a gas man and I can tell you probably from my experience in the office and otherwise our large expenditures in making gas incurred for certain materials and labor. The principal expenditures according to my experience are coke, oil, coal and labor. The oil appears to be the largest item I have. There is a difference of $10,000 on a year, between generator fuel and water gas oil. I did have something to do with paying out the money which is reflected in these expenses that we are talking about. I audit every voucher on which payments are made, and countersign most of the checks. I [fol. 353] audited the vouchers for those expenditures for oil and coke. I have everything to do with the payrolls. I audit the payrolls and sign each payroll of the company, and audit the voucher upon which it is paid and usually countersign the check. I audit the voucher for the payment for oil.

That term "audit" starts back with the original purchase order. Any material which the company wishes, is purchased through a regular purchase order. The head of the department requiring the material makes requisition on the purchasing agent for the supply. This requisition is sent then to the purchasing agent, who gets competitive bids where we have not a contract. Where we have a contract, he places the cost on the requisition. The requisition is then sent to the general manager for his approval. After it has been approved, the purchasing agent then makes up the order in triplicate. One copy of the order goes to the concern who is to supply the material, one copy goes to the department who is to receive the material, and the other copy goes to the auditing department. Every requisition goes through the purchasing agent, whether it is for material that I have under contract or otherwise and if I have it already under contract, he does not invite bids, but merely indicates that fact on the order. Then it goes to the gen-

eral manager, all of them go through his hands; he signs them.

Of course in the absence of the general manager, it is done by the man who is in charge of the company's affairs. Upon receipt of the goods, the department receiving them [fol. 354] notes that fact on their copy of the original purchase order, showing the date, and they sign for the material received in good order. That copy is then sent to the auditing department, who check it with their copy of the order. It should be identical except as to the receipt of goods. This is done to see if there is any difference between the amount received and the amount ordered. Upon receipt of the bill, then, from the vendor—the people from whom the material is ordered—the auditing department checks the amount shown on the bill, the amount of the material and the unit price and the extension, with the order. Finding that it is O. K., they sign it and then it is entered in the material supply book, to show that the materials have been received and are then put in stock. I do not do that before I get the bill for it; not in the material supply books. The material supply books reflect the amount of material in stock, and the material is not in stock until we get the bill in. Regardless of the fact that we may not pay the bill right away, as soon as the bill is received, we put the goods in stock.

They might have gone in stock, not a month before necessarily—a few days, but at the close of the month; if there are any outstanding bills at that time, we make every endeavor to get those bills from the vendors. Not being successful, we make up a memorandum bill and with the use of this memorandum bill, we then post it into the stock record. When I audit a bill, I make this check that I have just spoken of here. The bill is attached to the voucher, the bill of the vendor, and on the bill appears the information that [fol. 355] the material has been received. That is put on there by the order clerk, from the information he gets from the receiving department, and the order clerk signs it as having checked it against the purchase order. The stock clerk signs it as having posted it in the stock records. The accounts payable clerk posts it to show that it has been properly posted in the accounts payable, in the abstract

book and also in the accounts payable ledger, to shown that it has been completely entered in all the necessary records of the company. I check these items over to see that they have been propery initialed by the departments handling it, and in the case of large contracts such as coal and oil, I glance at the unit prices to see that they are the same as the contracts, and then I sign the voucher. I check the bill, of course, against the voucher to see that the amounts are identical.

All the material that I use or that I get—coal, oil and other things—goes into the stock that I spoke of. Pr*a*ctically everything goes right into stock. There may be some very minor items that don't get into stock. It does not become an expense of the company in the making of gas while it remains in the stock account.

I have told you how I audit the vouchers in paying for coal and oil and other things, and how things are bought.

In the case of auditing the payroll, I had better go back and explain the whole payroll system in order to make it plain.

When I received the payrolls, when the payrolls come to my desk, they have the name of each man, his rate of pay, the number of hours worked and his extension, showing the total amount paid to each man. Now, with that payroll I [fol. 356] receive what is known as a change sheet. This change sheet shows any changes between that payroll and the payroll of the previous week, if it is a weekly payroll, or any changes from the previous periods would appear on this payroll, this change sheet. It also shows the amount of money on the previous payroll and the amount of money on this payroll, showing the increase or decrease, whichever the case may be, and I check over these changes to see that they are all indicated on the payroll, and sign the payroll.

Itake my expenditures in a year for material that goes into stock, that are put in the books here and charged, of course—in the first instance they are changed against materials and supplies. That doesn't have anything to do, necessarily, with operating expenses at all. But payrolls are charged right against the expense account.

All the men on the payroll may not be entirely engaged in the operating branch of the company's activities. We have to distribute the items there, the time of the men and the

amount expended for expenses and the amount expended for other purposes, fixed capital, and so forth. I have charge of that distribution. I indicate in some way the different men working down in the works, making gas or something like that; it is indicated by the works. For instance, in the case of the works, the clerk at the works distributes the time, and the time book which he carries is O. K'd by the head of the department.

The oil is received in the tanks at the works, and on these [fol. 357] two tanks appear gauges. They check the amount received from the oil company by the gauges, and then they check the amount used each day by the gauges on the oil tanks, reading the gauges each morning at the same time. In our yearly experience here, which has been marked for identification, it shows a certain total amount used for gas oil in making gas. That refers to the difference in the amount of oil on hand at the beginning of the year 1923, plus the purchase during the year 1923, less the amount of oil you have at the close of the year. That is what that figure will actually represent. That is what it is supposed to stand for and that would involve knowing how much oil the company had on hand at the end of last year. Readings are made daily by the clerk and then the engineer in charge of the works makes a report. It is recorded in my office how much oil the company had on hand at that time at the end of 1923. It was recorded, and the information was furnished from the works. I knew how much they bought in the meantime so I could figure out how much they used during the year. Of course there are no gauges in the coal and coke, but they ar eweighed. I got a certain amount for my figures here in my books for generator fuel in 1923. That would represent the amount of that material bought during the year plus what I had on hand at the beginning of the year and less what I had on hand at the end of the year. I took an inventory at the beginning and also at the end of the year. We inventory it usually on a monthly basis. However, there is no large variance between the survey or the inventory taken and the book figures. In the book figures we [fol. 358] make no adjustment, in the case of coal. Those are the two principal items. There is quite a lot of repairing expense, expenses for repairs, which includes some repair material. That is handled by the man in charge of the

works who determines what repairs are to be made and the foreman in charge of the repair gang makes a requisition on the storekeeper for the material needed. In case the repair job is estimated to cost more than $50 a regular maintenance and repair requisition is made up and it must receive the approval of the general manager before anything more is done on it. That maintenance and repair requisition would then receive work order number and all charges would be carried through that order; but on small repairs the requisition is made on the storeroom keeper and he supplies the material; the man receiving the material signs for it and the storekeeper signs for it showing it to be delivered and charged to the proper account, and it indicates on the storeroom requisition the proper account, and that ticket is sent to the Auditing Department, which checks and extends the unit cost and total cost of the material used. I was speaking about the works.

For instance, repairs in the Distributing Department would be carried through the same way. It is taken out of stores and then the requisition is signed both by the man delivering and the man receiving, and those are forwarded to the Auditing Department and posted in the stock books, and carried through the general journal into the expense account. Everything has gone into stock in the first place and it is taken from the storerooms then [fol. 359] and an effort is made at least, whether it is accurate or not, to find out what that material cost the company, that portion of it which goes into the repairs and then that is charged up to that particular activity. If it is repair of mains or repair of services, I charge that much for material. The same way if I was repairing a generator. I have some rechecckering. I credit my storeroom account and charge it to this expense account. I charge for all material anyhow that is used in repairs. It is credited to store account and charged at its actual cost to the company plus the handling charge, which is the cost to the company, of course. An inventory is taken of all the materials and supplies of the company once a year, and then if there are any differences, those differences are adjusted at that time. I should say about ten people are engaged in this general accounting. We keep all the accounts prescribed by the Public Service Commission with the excep-

tion of an account called Accrued Amortization. I do not keep any account called the "Accrued Amortization." I keep one account called Provision for Plant Withdrawn from Service.

There has been a change in the uniform system now. I do not believe the 1924 system of accounts has that Amortization Account.

The oil received by the company is always under contract and has been since I have been employed by the company. Coke is also under contract. As to coal, we were not under contract for coal during the year 1923.

[fol. 360] Repairs to mains and services were carried on as regular routine. There may have been some particular jobs of repair that Mr. Duncan may have done during the year, but I cannot say. For instance, the labor appearing in our expense accounts here for 1923, was practically all done by our own employees. I cannot say without going into it, but it was not generally done by contract. There may be here and there something that was contracted for, but as a rule it is all done by our own employees.

We spoke about the expenses of material that went into repairs and the expense of labor that goes into those accounts. Those are things taken from our own payroll.

I did make every honest effort to have the books kept so that they would reflect the true condition of affairs of the Kings County Lighting Company, both as to operating and other matters. They have been audited by some outsider. We have a continual audit made under the direction of W. E. Freeman. He audited them for 1923 and has finished his work.

(Plaintiff's Exhibit for Identification Nos. 43, 44, 45, 46, 47 and 48 are now received in evidence.)

I am preparing from these books our annual report to the Public Service Commission; it has not been completed as yet and therefore has not been filed. The rules require its filing, I believe by March 1st, and it probably will be filed then. In years heretofore I have filed the annual report [fol. 361] taken from similar books.

In the case of last year's report filed, the representatives of the Public Service Commission visited my office and went over the annual report with me, pointing out certain

items which they seemed to think contained discrepancies, between certain of the schedules, as shown by the Public Service Commission, and we checked those items, the representative and myself, and in some instances he inspected the books of the company to see that they agreed with the Public Service Commission report for the year 1922. No representatives came from the Public Service Commission covering the 1921 report, but we received from them letters concerning the putting out of certain matters that appeared to be discrepancies. They did request certain information from me about it. We supplied that information. Take, for instance, these books that I have got here. They show expenses paid for fixed capital purposes. I have obtained orders from the Public Service Commission authorizing me to issue securities for those purposes, on the figures shown in those books. The last check made by the Engineering Department of the Public Service Commission covering capital expenditures brought the expenditures down to March 31st, 1923.

There was an order made covering the expenditures down to that date, by the Public Service Commission. I received a copy of the order over the seal of the secretary of the Commission. We did not completely comply with it because the provisions of the order are not completed as yet. The order covered the reporting of the issuance of [fol. 362] the stock or the issuing of securities to be made, and the receipts of money to reimburse the treasury for capital expenditures.

(Plaintiff's Exhibit No. 42 for identification is a correct copy of what appears in the books.)

That is, it is a correct copy so far as it goes. It is only operating expenses and taxes.

(Plaintiff's Exhibit for identification No. 42 is now received in evidence.)

That exhibit which has just now been offered in evidence, represents what I would testify to in detail if I were asked a question concerning each and every item, this question being asked whether or not as to each item it correctly reflected the same item existing in the books of the company which have been offered in evidence today.

This exhibit 42 is all in the precise titles used by the Public Service Commission system of accounts except the account I spoke of, "Withdrawn from Service." I divide the expenses up here on this first sheet according to production expenses. These are general titles, sub-dividing it into different departments. The production expense includes the cost of putting the gas at the outlet side of the holder, the storage holder. Coal, oil, labor and other materials used in the manufacture of gas, and the repairs necessary to works apparatus and buildings used in the manufacture of gas. Suppose you pai-t a holder. It would appear in there under Repairs to Holders.

The Distribution Expenses; that takes in the expenses of distributing gas, and repairs to mains, meters, services, and [fol. 363] to buildings and apparatus used in the course of distribution. It does not take, meter readers' time, that would be found under the general head, Commercial Expenses.

From this Exhibit No. 42 you cannot tell how many gallons of oil I used last year and what I paid for it. We cannot determine the number of gallons of oil used in the production of gas from this Exhibit; we can only determine the cost of that oil. We cannot determine how many tons of coal used. Our books here (indicating) do not show that. That is all kept in dollars. For the tonnage and the quantity of oil you will have to look into the Material and Supply Books. The Material and Supply Account is not kept in there at all, in these books. The general account is there showing the amount of money, but, nothing as to the amount of material, or inventory.

I have a statement that will enable you to tell how much coal I used and how much oil I used, and one thing and another, in other exhibits. This shows the amount of material, the unit cost and the amount of money.

(Marked Plaintiff's Exhibit No. 49 for identification.)

I have here on this Exhibit No. 49 for identification, Cost of Production, the same as appears on Exhibit No. 42. In other words, each one shows the cost of production of $892,501.13. I have taken and sort of segregated it. In Exhibit No. 42 that expense is segregated. It is shown in great detail on 42. For instance, it shows it divided into different

classes of labor there. Then I come down and say Boiler [fol. 364] Fuel, Water, Generator Fuel and Water Gas Oil. I have taken on this Exhibit No. 49 and resolved that amount, for instance, of $301,814.14 shows in Exhibit No. 42 into tons and dollars per ton for our generator fuel, on Exhibit No. 49. That is what the first item on Exhibit 49 shows. We got that data—we got the quantity from the yearly manufacturing report of the works, which is checked against our book records at the office. It is shown in pounds in the manufacturing report, and it has been reduced to long tons. That generator fuel consists mostly of coke, practically all coke and I have 29,995.141 long tons.

$10.622 is the cost per ton, computed by dividing the quantity into the amount of money as indicated under the amount column. That is what that fuel stood me in the generator, including handling charges, too.

This Exhibit No. 49 shows how much that means per thousand cubic feet of gas made for generator fuel. This also shows the number of pounds used per thousand cubic feet of gas made. I treat the boiler fuel in the same way, and gas oil. I have a total here of 5,604,166 gallons. That means that that is the quantity our books show was consumed last year and shows the number of gallons per thousand cubic feet of gas made. This exhibit also shows the quantity of gas made during the year. I got that data from the manufacturing report. The manufacturing report indicates the amount of gas made. There are two meters in the works—three meters at the work, but two have been used in arriving at this amount. These are the difference [fol. 365] in the readings between the first of the year and the last which would indicate—these figures are based on the meter readings at the works. I also have here the gas sales to consumers. That figure is supplied by the accounts receivable department. That is, that represents our meter readings of the customers' meters. They are read every day during the year; the consumers' meters are read from the first to the 26th day of the month, regular readings are so taken, and irregular readings are taken from that time to the close of the month. There is some gas made in 1923 that does not appear on here. I did not read all of them. There is some 1923 gas that does not appear there, but we get an overlap from the end of 1922. It may not be the

same overlap in each year, at the end of each year, but it is approximately the same.

Consumers' Meters I read daily. We divide the meters up into trips so as to stretch the work out over a month, 26 days. All the meters are divided by 26, and we arrive at the number to be read each day, and we then make up the trips to be read, and those trips are read each day. For instance, on the 18th of February the meters that I read that day would be read from the 18th of January to the 18th of February, except when meters have been skipped; and on the 19th day the meters read on that day would be read from the 19th day of January to the 19th day of February, and so on, so that at all times there is about a half a month of gas that has been sent out and that has not been read. It is registered on the consumers' meters but has not been read. The gas that I did not get at, the 1923 gas that was [fol. 366] used in December, 1923 and did not get into the readings that year is offset by a substantially like amount of the 1922 gas from December, 1922. That is how that adjustment is made and has got to be understood here. I cannot read from the first of the year to the last day of the year exactly. The figure at the bottom shows the total amount of gas sent out as reported from the meters at the works. We show here the amount of gas made. We may send out more than we make, or less than we make. The bottom figure here shows the make to be 1,977,410. We always read it in thousand cubic feet. It is one billion. It is not in units of a thousand cubic feet on the exhibit. That is the amount of gas made. There were 96,000 cubic feet more sent out. On the storage holders, where we had 96,000 less cubic feet in them at the close of the year than at the beginning of the year, we drew down on our storage. The first sheet here is practically self explanatory. Treats these expenses shown on Exhibit 42 by reducing them to tons or gallons and gives the unit cost for them, some of them.

The next sheet, the second part of Exhibit No. 49, that takes up the distribution expenses and that is substantially the same, as on Exhibit 42, except some are joined together; a few combinations here.

In the taxes here I have shown some details of the taxes which appear on Exhibit 42. I have some figures here real estate, land, 997,000, that is assessed valuation of the land.

[fol. 367] There is the assessed valuation of the improvements also. That is the total $78,610.60 taxes on land and improvement. I have then deducted the amount applicable to that portion of the land that has been leased to the Morse Dry Dock & Repair Company at the works. It is all assessed as one parcel to the company. I divide the taxes according to the land area. Just as Mr. Porter and the other witnesses valued it. Special franchise taxes I have here at $1,953,000. That is the franchise tax assessed by the State of New York. That is the assessment, the equalized assessment. I have at the bottom here a unit cost of gas sold. That is the same as it appears on Exhibit No. 42, i. e., $.9138 per thousand cubic feet of gas sold.

On the top of the other sheet it shows it on the basis of make and it shows the production cost on the basis of make. The production cost on the basis of make is $.4513 per unit and the production cost on the basis of sold, $.4973. None of these books that are received in evidence show the amount of gas manufactured and the amount of gas sold. All those figures appear in that journal Exhibit 48 but they are not in the same shape that they are here in this exhibit. The number of cubic feet manufactured and the number of cubic feet sold are in the book.

I was speaking about the figures appearing upon Plain-[fol. 368] tiff's Exhibit No. 42. The sales of gas appearing there are in this Plaintiff's Exhibit No. 48, Gas Sales and in order to get the cents per thousand which appears I have divided the dollars by the cents per thousand, or rather—by the total number of cubic feet sold. I reduced it to cents per thousand for the different items of expense. For the convenience of comparison; that is the idea. Our general ledgers do not carry it in cents per thousand. The "make" we get from the manufacturing report. I have the manufacturing report here. That is a yearly report (handing counsel). This is from the files of our Company, and covers the year 1923. The accountants on the other side had it all. This is our permanent record of the make for the year.

The Master: That will be received and marked Plaintiff's Exhibit No. 50.

(Marked Plaintiff's Exhibit No. 50.)

It gives the gas made as 1,977,410,000. All these figures are set forth on Plaintiff's Exhibit No. 49 for identification in these books or records that have been offered in evidence, except those that have been computed. The computations are mine. I have not personally made the computations. They have been made under my supervision. For instance, the first item, "Generator Fuel," that number of tons is given under the heading "Quantity," that is shown in one of these books. The number of tons would be shown in pounds, in the journal marked Plaintiff's Exhibit No. 48 and that is true as to all of the other items set forth under "Quantity." They are in the journal. If you want to [fol. 369] check them up you had better do it right from these journals. We have some books for that purpose, material and supply books. This is also indicated on the manufacturing report. The manufacturing report is not in evidence, not as to this, but it is in evidence as to the number of cubic feet of gas made, as I understand it. On this Exhibit No. 50, that will show the amount of material used during the year. For the figure given and the amount of gas sold it would be necessary to add the monthly balances in that ledger.

If I was separately asked with reference to each item here appearing on Plaintiff's Exhibit No. 49 for identification as to what the figures would indicate in the columns on Sheet 1 and on Sheet 2 I would answer, in the same way. These would be the amounts that I would give in my responses to queries with reference to all the items appearing on the left-hand side, as they appear on both sheets. It is on the extreme right-hand side of the page, the caption at the top of the column reads "Material Per M. C. F. Made," which means material per thousand cubic feet of gas made. If you want to make it into gas sold you add about nine per cent.

(Plaintiff's Exhibit for Identification No. 49 was here received in evidence.)

This exhibit is merely a summary of what the books show, too; this is a summary of what the books of the plaintiff show, arranged in a form suitable for the convenience of the court, together with certain computations, based upon what the books show.

[fol. 370] GONNOUD

Cross:

The general ledger No. 6, marked Plaintiff's Exhibit No. 43, on pages 2 and 4, is the fixed capital account of the company shown. That represents the amount of money charged to fixed capital accounts of the Kings County Lighting Company. It represents also the latest additions to the fixed capital account down to December 31, 1923. General Ledger No. 6, carries forward the amount of fixed capital accounts prior to January 1, 1923.

The only items indicated clearly here are the purchases of fixed capital during the year 1923. The balance of fixed capital as of December 31, 1922 is carried from the previous ledger to this ledger. When we opened this ledger we carried forward from the previous ledger the balance shown then in the fixed capital accounts of the company, so that the last total figure represents the cumulative figures involved in the fixed capital account.

General Ledger No. 5 covers 1922. It may be that it included two years, 1921 and 1922. It would be indicated in that general ledger No. 1 what the company began its fixed capital account with on that date. The first ledger opened up by the Kings County Lighting Company indicates the amount of fixed capital as of that date and general ledgers from 1 to 6 inclusive would indicate the entire history of the fixed capital added from time to time.

The ledgers Nos. 1 to 5 inclusive will be known as Plain-
[fol. 371] tiff's Exhibit No. 51.

(Ledgers Nos 1 to 5, inclusive, marked Plaintiff's Exhibit No. 51.)

The Plaintiff has not, to my knowledge in its possession any of the books of the Kings County Gas & Illuminating Company. I have seen some of the books of the Kings County Gas & Illuminating Company since I have been with the company, the Meter Reading Books, Consumers' Ledger, that is all. I do not know the whereabouts of any of the books of the Kings County Gas & Illuminating Company that show the capital account of that company.

The cash of the company, what we get along with from day to day, is kept in the cash book, that shows the aver-

age amount of cash on hand during each month of the year, on a daily basis. This general ledger will show the average amount of cash on hand for each month.

General Ledger No. 6 will show the average amount of cash on hand at each month, and will show the average amount of materials and supplies and totals carried on hand each month. Page 24 shows the general cash from month to month.

We have not changed the name of our accrued amortization account. We have not any accrued amortization account name to change. We use as a substitute for it an account called Provision for Plant Withdrawn from Service. That is the name of the account that we have. We have not changed the books this year as yet. You see, the January figures are not out yet, and I will probably go into that matter in the next few days to find out just what I want to [fol. 372] do about that matter of changing any titles. The figure that we use here for Provision for Plant Withdrawn from Service, per thousand cubic feet of gas sold is three cents. This is a figure that has been supplied by the resolution of the Board of Directors, in 1920 or 1921.

On page 180 of Ledger 6 there is a sum represented which indicates that there is a credit to that account over and above what I have actually used to cover plant withdrawn from service in the amount of $201,910.62, as of December 31st, 1923.

On Plaintiff's Exhibit No. 49, the price indicated in the cost of production as boiler fuel water gas tar used in 1923 is $.071219 per gallon. We credited the cost of production of the residuals reported made at $.051737 per gallon; the figure $.059483 per gallon, included drip oil. At the beginning of the year water gas tar was 279,262 gallons. I cannot say off-hand if 9.93 cents per gallon is right, but it probably is. I do not know whether it is. There is no way that I have at the present time, of checking that figure. We carried in stock as of January 1st, 1923 204,194 gallons, of water gas tar at $.0993 per gallon, and 75,088 gallons of water gas tar at $.0525 per gallon, then .0993.

We did not sell any of this water gas tar during the year. I have made no effort to figure out the value of this tar as [fol. 373] compared with solid fuel and I do not know what the equivalent in solid fuel is. The chief engineer would

be the one to determine how many pounds of water gas tar is equivalent to so many pounds of coal. I do not believe that is determined upon the heat value. I believe that is determined apon the weight. Those figures are furnished to me by the Chief Engineer of the company, Mr. Bogie.

I charged gas production most of the time with water gas tar at the amount used. The figure is shown here on this exhibit, water gas tar at 7.1219 cents per gallon. That means 7 cents, 7 with a decimal and a fraction and the other is 5 cents with a decimal and fraction. That is a residual of the oil and that is the cost of the oil. We take the actual cost of the water gas oil that produces the tar and we credit the production expenses with the exact costs of the water gas oil.

Tar is produced from the water gas oil and the amount of tar produced we credit during the time it is produced at the price of the water gas oil itself, at the cost of the water gas oil. Then we carry that in stock at that price until it is used and charge it out. Now, this 7 cent water gas tar here is charged at 7 cents here but that is an average price. We had it charged into the production, all that stock we had on hand at the beginning of the year, at the price at which [fol. 374] it was carried in stock. The tar is produced as a residual of the water gas oil used in making gas. The tar produced is charged to materials and supplies. That is carried in the stock account at the cost of the price of the water gas oil that was used in producing the water gas tar. As we use the water gas tar out of the stock we charge production expenses with the cost of that water gas tar. You shouldn't deduct at the same time a certain sum of money from the cost of water gas oil to keep your balance exactly correct. We credit it against the production expenses here.

This figure that I have just given here, 7 and some fraction cents per gallon, is not the average cost during the period covered by this exhibit that we paid for our oil, but that is the average cost of the water gas tar that we used during that period, based on the price of the water gas oil at the time that this water gas tar was produced. That is because we started at the beginning of the year with a supply of tar on hand. It makes that figure higher than it would have been.

The reason why I make the distinction is that there are two residuals there, drip oil and water gas tar. Water gas tar is 5.173 cents per gallon. As to the drip oil we have not any cost per gallon here shown on this exhibit. The amount of money is $2,106.02. It is the amount of money we received on the sale of drip oil during the year 1923. [fol. 375] The Naval Stores buy it. I do not know what they use it for. We always figure what it is worth to us and if we can get more for it we sell it. We have used it as fuel. Certain grades of the drip oil have been used the same as water gas oil. If we had a certain amount of stock on hand of water gas tar when we began business on January 1st, 1923, that was really a credit to the 1922 operations. The tar we had on hand as of January 1, 1923 could not have been utilized in making gas in 1922. In charging consumers for the benefit of that water gas tar in 1923 the tar was credited. During 1923 all our tar was used, the tar on hand as of January 1, 1923, and that was charged against the manufacturing of gas. It was paid for by the consumers in 1923, and the price that they paid for it was on the basis of its cost in 1922, that proportion of it that was on hand at the time.

The 204,124 gallons of tar carried in stock at 9 decimal—I say those figures of 9.92 cents per gallon, are right. 204,-124 gallons. We were carrying that much in hand and we were carrying in addition thereto another amount at the new price. You see, the gas oil was purchased at two different prices in 1922. The price changed toward the end of [fol. 376] 1922, so as soon as the price changed, why, we changed our cost of water gas tar, but we did not commingle the two. We kept them separately so as we could charge off all the old tar first.

I do not know if we charged production cost with water gas tar at the rate of 9.92 cents per gallon up to and including July, 1923 but we did up until we exhausted the amount on hand as of January 1, at the old price. The last of it was charged off in July, 1923—the last of the water gas tar at 9.93. During that same month some of the water gas tar was charged at 5.25. You see, on January 1, 1923, we had on hand some at the price of 9.93 and some at 5.25 that had been produced in 1922. Now we charged off during the year 1923 all the 9.93 first, and as soon as we

had exhausted that 9.93 we started in charging at the 5.25 price.

I do not know whether we were paid for water gas tar. It was charged into the operating expenses at that price, at the price that it was credited to the operating expenses of 1922. We always have stocks on hand at the beginning of the year, whether it be coal or water gas tar or what it may be that was purchased the year previous or produced the [fol. 377] year previous, and we charge out in the year that they are consumed at the price they cost us. 07.1219 is the actual average between the 9 and the 5. That is the only amount that is shown on the exhibit. There is no price there of 9.93, because we had two different prices during the year, and that is the average cost of the water gas tar for the complete year.

My definition of a weighted average is different from an actual average. We could not get any one average on this thing unless we were trying to find out what the average production was during the year per month on a consumption basis. I did not add the two prices we paid together and divide by two, but took the total amount as the weighted average. I used in crediting residuals during the entire year 1923 about 5.25 cents per gallon. For the entire year of 1923 we paid for residuals at the rate of 5.1737 cents per gallon and according to Exhibit No. 49 we charged production at 505,550 gallons of water gas tar. That is the amount of gas tar that was consumed. It also shows on that exhibit that I credited during that year production with 272,046 gallons. That is the amount of water gas tar produced during the year. It is due to the fact that that was the number of gallons of water gas tar used during the year [fol. 378] in the production of gas, the 505,550, and the other item of 272,046 gallons is the amount of water gas tar produced during the year of 1923. It shows that whereas we charged production with tar used at the rate of 7.1219 cents per gallon, we credited production with tar at the rate of 5.1737 cents per gallon. The company estimates the amount of tar that is produced. The amount estimated at the present time is 8 per cent of the water gas oil used. 8 per cent of it is water gas tar. I believe that is the figure, 8 per cent, at the present time. We have very different figures during the year 1923. It was not 8 per cent all during the year 1923.

To verify that figure it could be easily computed here by dividing 5—after making calculation) 4.85 plus per cent. That is the average production throughout the year. Part of the year we used 8 per cent and part of the year we used 4 per cent. The percentage of tar produced is determined by Mr. Bogie, Chief Engineer of the company. Whether or not there is a definite relationship between the amount of gas oil used and the amount of water gas recovered depends on the quality of oil, the quality of oil with reference to the Baume gravity. It would vary with the quality of oil and the cycle of operation and all of the factors that go into the operation of the plant. That question involves the operation of the plant. I could not explain that.

[fol. 379] Our books do not show that we reported *recovering* in January 1923, 22,298 gallons of water gas tar. In February it does show 22,298. I reported the use of 22,981 gallons of water gas tar. That is the number of gallons of water gas tar that was used in the production of gas during that month.

The amount of water gas tar produced in February 1923, was 20,472 gallons; the amount of water gas tar used in February 1923 was 20,384 gallons. For March the amount of water gas tar produced was 22,091 gallons. The amount used was 15,611 gallons. Water gas tar made, April, 1923, 19,586 gallons; water gas tar used April, 1923, 27,048 gallons. May, 1923 water gas tar produced 18,947 gallons; water gas tar used, 27,668 gallons. We used more than we made, that month. June water gas tar made 15,880 gallons; water gas tar used 67,228. July water gas tar made, 14,951 gallons; water gas tar used, 45,712 gallons.

The first figure that I gave with reference to the amount made was 14,951 gallons made and 45,712 used. For August; water gas tar made 13,785 gallons; water gas tar used, 46,304 gallons. September: Water gas tar made, 17,477 gallons; water gas tar used, 86,632; October: Water gas tar made, 29,493 gallons; water gas tar used, 72,011 gallons. November: Water gas tar made 37,439 gallons, for water gas tar used 43,120 gallons. For December Water gas tar made, 39,627 gallons; water gas tar used, 29,851.

[fol. 380] My books do not show that from June 1st, 1923 I reported recovering 103,394 gallons of water gas tar that

is from and after June and including June, too. We recovered 168,652 gallons of tar and 390,868 gallons was the amount that we used during that same period of time. The amount made from January 1st, 1923 to June 1st, 1923 was 103,394 gallons; the percentage of tar recovered from the oil used, shown in my Plaintiff's Exhibit No. 49, that the tar bears to the oil used in the year 1923, was 4.85 plus per cent.

Every factor that enters into the manufacture of gas enters into the production of water gas tar. The amount of condensing equipment and the number of generators in operation, the size of the generators and everything that enters into the manufacture of gas at the manufacturing plant of the company.

[fol. 381] Our annual report to the Public Service Commission shows that in the year 1922 we recovered as tar about 10.50 per cent. of the oil. The figure is slightly below 10 per cent. We had 15,776 gallons of water gas tar on hand at the end of the year, 1923. Water gas tar is stored in the settling well and some of it in the relief holder and we have two tanks from which we use the tar under our boilers and we use that for storage, too. That is our 55th Street and First Avenue plant.

The relief holder is situated close to the generator houses. The two tanks from which the oil is used under the boilers are housed next to the exhauster house, part of the same building. The settling tank is right beside the boiler house. There is no inventory made of the water gas tar on hand, as we cannot determine the exact amount of it, but during the year the water gas tar settling well was cleaned out—the sediment on the bottom, and a credit was made to the material and supply account of the amount cleaned out of that settling tank, and we at that time were able to determine as nearly as possible the amount of water gas tar on hand. The tar comes into the settling well with water and tar in it. The tar settles on top and the water settles to the bottom, and that is the way the tar is separated. You cannot determine how much is tar and how much is water [fol. 382] there. We do not take periodic inventory of the quantities of water gas tar on hand, but, the amount used is established because those two tanks from which we pump the water gas tar have gauges on the sides of them, and

as we use the tar, we know exactly how much tar is used, because we take the readings from that tab, We do not know exactly how much we produce. Water gas tar is charged to the cost of boiler fuel when used under the boilers. There was none of it used elsewhere but under the boilers during the year 1923. It was charged per gallon under the head of boiler fuel as indicated on Exhibit 49—7.1219 cents per gallon.

There is no rule that I know of as a matter of accounting in the gas business, of crediting the tar at the same rate per gallon as we charge it. That is a matter of accounting practice. The system that we use does not tend to increase the production cost of the gas sold.

In the year 1922 we charged production cost for boiler gas tar with the amount of $38,072.30 and credited for that year production with residuals in the amount of $51,586.24. I have no figures here with reference to 1921.

[fol. 383] We charge material and supplies with the total cost of the production of water gas tar, at the same time crediting operations at the time the tar is produced, at the same price. When we use the tar we charge operations with the cost of the tar at the same price, and we credit material and supplies with that amount, so that whatever is charged in finds its way into materials and supplies, eventually finds its way into the cost of production of gas. Our credit and our charge are exactly the same amount, so it does not make one iota of difference in the operating costs.

During 1921 and 1922 our credits were greater than our debits to production cost, but, on the other hand in 1923, our charges to production costs for boiler tar exceeded the credits by $19,824.05. That in effect increases our production cost for the one period, but over the whole period it equalizes. There would be a corresponding increase in the cost of production per unit of thousands cubic feet of gas sold; that is, as distinguished from the number of thousand cubic feet of gas made, the amount of money would be exactly the same, but, the rate per thousand would be different. It would change the rate per thousand. The cents per thousand would be different, but the amount of money would be exactly the same.

There is a credit of .82 cents for tar, so there is a net difference of 1 cent on each thousand cubic feet of gas made.

When that goes into the sales, it would be a cent and one-tenth of a cent—about, now. The dollars do not change; the cent per thousand change because your unit is different. [fol. 384] We show the cents per thousand cubic feet made on all manufacturing costs as shown on page 55 of the Annual Report to the Public Service Commission, State of New York, December 31st, 1922. In our Exhibit No. 49 we showed a credit for the amount of drip oil sold in the year 1923.

It is not determinable how much we recover one year or another. I do not believe that we sold any the previous year or for several years. We may have sold some the previous year, but this is the amount of drip oil sold during 1923, and that is the amount of money we got for it. We don't throw any of the drip oil away, that is usable. The amount that we actually sold of the drip oil is shown on Exhibit 42. There is no number of gallons shown. It does not indicate the quantity. According to the Uniform System of Accounts we should credit all residuals of that nature, drip oil, at the number of gallons, the price at which it is sold, in the year in which it is sold.

There is no fixed percentage, that I know of, of the oil used to the amount recovered in drip oil. On Exhibit 49 we have a credit in cost per M. C. F. made of eleven ten-thousandths of a cent, that is the right figure—eleven ten-[fol. 385] thousandths of a cent, in other words, .0011.

As to the discarded meters, the scrapped meters, the details thereof are kept on the meter cards, meter life records. Those discarded meters get into the books of account in value. They are written off the capital account; they are entered in withdrawals. The discarded and scrapped services are handled the same way. They are credited against fixed capital account. The details of those withdrawals would be shown on the journal entries, showing a withdrawal. The general ledger would not disclose the nature of the property. The work in progress withdrawal order book would show all that, but the general ledger itself only shows the general account, the two fixed capital accounts.

They get into the account known as property withdrawn from service in the same way that the services do, and then they are applied against the fixed capital account itself so that the fixed capital account itself is the one that remains.

The withdrawal account is a suspense account and they are carried in there until all the work of withdrawing is finished, and then we write it off the fixed capital account. So that at all times our books disclose the fixed capital as the fixed capital actually exists in fact.

All service work is done by the contractor. We pay the contractor for his work of installing a service from the main to the lot line of the consumer. The consumer pays the contractor for the balance of the work from the lot line into [fol. 386] the inside of the wall. A lot line is the line of the property back of the curb, to which title has vested in the person owning the premises. The service is always run through the wall of the foundation into the premises.

The contractor's work is finished when he puts in the service. The header work—and that is all other piping done on the premises of the consumers—is usually done by a plumber, which the consumer or owner of the house pays for. That is the practice that prevailed June 1st, 1923. The consumer has been paying for all piping inside the lot line since May 1, 1921. Before May, 1, 1921 the company put in all services and did all the piping necessary to connect the meter inside, all the header work, without charge to the consumer. That practice prevailed ever since the company was doing business installing services.

The books of the company would indicate that the company installed the mains and services. I should say there are about 200 unfilled or uncomplied with applications for services at the present time. They come and make application when they start a building, and some of them are not ready to have the services installed. It is just in the general course of business. We have at the present time about 200 service orders on hand. We fill those service orders about ten days after we get the permit from the City, as a rule, but if they are not ready, we hold them up until they [fol. 387] are ready.

The 30th Ward is growing very rapidly. We get a statement from our architectural bureau each week as to the number of buildings going up in the territory.

You are asking me at this particular time of the year, when they are not putting in orders for services. If a service order is placed with the Company, and there is frost in the ground, we do not put that service in except under an

additional frost charge. It costs more money to put in a service under frost conditions than it does otherwise, so builders hold up their service applications until the weather gets more mild. Furthermore, they are not building as fast during this extremely cold and stormy weather. If there are five thousand new buildings under construction, we do not have five thousand applications on hand. There is no relation between the number of buildings under construction and the number of applications for services on hand. The relationship is between the number of service applications received, but not the number of applications on hand.

In the case of interest during construction we charge interest during construction until the close of the year and then we spread it over the several projects that have been affected thereby. The reason for doing all this spreading over of overheads of these accounts such as engineering superintendence is so that when we come to re-ire a part of fixed capital, we then have an actual cost of the fixed capital, including these overhead charges. Otherwise, we would [fol. 388] have very great difficulty in retiring any project if we had to go to these overhead accounts and try to apply some amount of that overhead to it.

If the law expenses during construction can be charged to a particular project, that is if the law expenses involved concern one particular project, one sub-division of the fixed capital accounts as prescribed by the Public Service Commission, we charge direct to that particular account the law expenses involved. If the law expenses are of such a general nature that they cover several of the different fixed capital accounts, we would charge that amount to law expenses during construction. At the close of the period, or at the close of the projects for which that law expense was incurred, we would distribute the law expenses over the several different projects.

There must be some in that period since 1908. There must be some law expenses in there. As law expenses, they have not been charged—I have not had any charges in there as law expenses into the construction work, law expenses during construction. There must be some in there with respect to injuries. The compensation insurance is split every year as between the operating and fixed capital

accounts and charged into the several fixed capital accounts affects. The percentage of allocation used is the actual percentage in the case of compensation insurance. We make a report monthly to the Compensation Insurance Company, a classification of the labor performed on the different fixed capital accounts and also the operating accounts, and we charge the expense of the compensation [fol. 389] insurance against insurance until the close of the year, and we then credit the operating expense account insurance with the amount chargeable to the fixed capital accounts and we charge that amount to the fixed capital account. During construction no taxes are charged, but we have charged interest during construction.

That amount $4,083.02 covered the cost of organization work in connection with the issuance of our securities. During that year we had an issue of 8 per cent preferred capital stock and the expenses incurred in filing our certificate of amendment with the State authorities, any taxes in connection with that, and all expense in connection with the issurance of that 8 per cent preferred capital stock. That expense we did not get until 1922. You see, on fixed capital accounts—we don't cut off at the close of the year on fixed capital accounts. The $4,000 item would cover that 6½ per cent mortgage proposition in connection with the issuance of the bonds. I cannot identify just exactly what it covered, but it is the change in the financial structure of the company—organization expense.

An uncollectible bill cannot be allocated to a particular year. We cannot take an uncollectible bill that runs over six months or eight months and find out what year that became an account receivable, and the determination of [fol. 390] when an account is uncollectible is a matter of opinion in the minds of the operating company. Now, $2,500 was set up in 1923 in addition to the amount of uncollectible bills which we had set up in a suspense account of a previous year in addition to that, but the fact that we set that $2,500 up there does not mean that we did not incur durring the year 1923 uncollectible bills of that amount. The reason for setting up $2,500 was to allow for the proper amount for the operating expenses for the year 1923 for uncollectible bills. If we set up less than that amount that we did set up, it is my opinion that we would not have set up enough in our operating expenses for it.

The $2,500 is an estimated amount based upon the amount of uncollectible bills, that is, the amount we carry in what we call bookkeeper's expense. When an account is closed on the accounts receivable and we cannot collect it within sixty days, we take that account out of that book—take the whole account right out of the books and carry in what we call bookkeeper's suspense; so that we can make a special drive on those accounts and try and get them collected before they are eventually written off. Now, in setting up this $2,500 I took for my basis the amount of money that had been set aside in what we call bookkeeper's suspense. I mean the amount of accounts receivable that had been set aside that way.

On Exhibit No. 42 under "uncollectible bills" there is an amount of $9,409.11. That represents an actual amount written off as uncollectible plus $2,500. $2,500 is set up as [fol. 391] a reserve account. That is the actual amount written off our books. You see, that is the amount of uncollectible bills for the previous year. That difference is the amount of uncollectible bills for the previous year that we have been carrying for a year with the hope of making collections on it, but as we are tightening down on that proposition we have uncollectibles with us every day, and we had, when I made up this report—my figures for the close of the year—enough to warrant my putting $2,500 against the expenses of that year, because they were the uncollectibles incurring in that year. It is an account receivable that we had previous to 1922, and we wrote off some $7,000 of those when we determined they were no good, and we wished to carry that $7,000. I knew it was not enough because we had the uncollectible bills for 1923 with us right there. We had uncollectible bills that we carried under these bookkeeper's suspense items, right with us. We had not written off those yet. Uncollectible bills are charged in as the amount of the bill not the amount it cost the Company to produce the gas.

At the present time when it is necessary to withdraw capital at any time, the head of the department makes up the withdrawal requisition, stating the capital to be withdrawn, and endeavors to ascertain the original cost of the capital to be withdrawn. If he cannot find the original cost of the capital, he estimates the cost of the capital and sends

[fol. 392] the withdrawal requisition through and it is approved by myself as to form, and by the General Manager, and then they proceed with the withdrawal of that capital. If there is any labor necessary in it, why, that is charged to the withdrawal suspense. Any credit due to salaries is credited to that account, and the fixed capital account is credited with the full amount, the full original cost or estimated cost, as the case may be, and the reserve for provision for plant withdrawn from service is charged with the cost plus withdrawal expense, less salaries.

This system has always been in vogue, back to 1908 with the exception of sending through the withdrawal requisitions. They have always withdrawn capital since 1908, they have been doing this. All these withdrawals are checked by the Public Service Commission engineers to see that the property has been properly withdrawn and the proper credits have been put into fixed capital. The last time they made a check was up to March 31, 1923, at which time they approved all the capital expenditures as shown on the books, and withdrawals. We have such an account called "Contingency Reserve." In so far as it is an optional reserve, the Uniform System of Accounts states that you may keep any optional reserves. Now, the Contingency Reserve is set up out of surplus. We separate our surplus, and that has nothing to do with operating expenses. The balance as of December 31, 1923 is $201,910.62 for plant withdrawal from service. The balance last December a year ago was $171,397.98, that is December 31, 1922. There is a variation in that account during the past [fol. 393] year; that is, during the year extending between January 1, 1924, and January 1, 1923, of approximately $30,000. There is $292,680.21 as a balance in our contingency reserve account as of January 1, 1924. For December 31, 1922 it was $256,695.72. There is an amortization reserve and uncollectible bills reserve. In the mortgage bond amortization reserve there is $38,189.99, and in the uncollectible gas bills reserve there is $5,000. That is as of December 31, 1923.

As of December 31, 1922 mortgage bonds amortization reserves $34,050.54. Uncollectible gas bills reserve December 31, 1922, $2,500. We have a surplus account. The amount that appears on the books as of December 31st, 1922 in the

corporate surplus account is $526,737.81. The amount appearing in the corporate surplus account on the books of the company as of December 31st, 1923 is $818,474.43. The surplus account of the company represents the difference between the assets and the liabilities sides of the balance sheet.

The chief engineer would have charge of estimating the value at which the mains, meters and services shall be charged off the books. Those figures are sent over and the auditor's department checks those figures, and if there is any question as to the cost of material or labor at that time, we go into the matter as thoroughly as possible and try to ascertain the cost of material at that time from concerns and from our books and records, and also the costs of labor from our books and records. If it is the manufacturing plant the chief engineer has charge and if it is a building of [fol. 394] some sort, the chief engineer would also do it.

On *our* about January 1st, 1917, the nomenclature with reference to our accrued amortization account was changed. We do not call it accrued amortization now. It was called at that time accrued amortization. That is, that was the name that I applied to that account prior to January 1st, 1917, thereafter we opened up a new account called "Provision For Plant Withdrawn From Service," after January 1st, 1917. We closed out the old account.

My recollection is that back in 1917 it was about $147,000. Now, I do not know the figures and I do not want to give it. I was not there, but I know the facts and I know the figures. I would want to give an exact figure.

Mr. Moran: We will tell you that on a certain day in 1917 we had in our accrued amortization of capital account a certain balance which we transfered to plant withdrawn from service and contingency reserve.

There isn't any particular classification of property retired from service. It is quite a number of classifications of property retired from service. I don't know without [fol. 395] going over all the accounts to determine which is the principal item that is retired since 1904 down to date. Most of the meters that are retired are meters that have been in a building where there has been a fire, a meter is destroyed entirely and then we retire it and retire it from

capital, but the actual retiring of a meter is not done in that way. Mains sometimes are what we call abandoned and retired from service on account of abandonment.

Occasionally a service is retired, but the only time we retire a service that I know of is when the cost of removing the service is greater than the value of the service itself. In order to retire a service, that is to actually take it up out of the ground we have to dig down and take it out of the ground and then remove it to another place, and we would simply change the location of the service and retire the other service as abandoned. We retire portions of plant equipment other than tools. I don't know off-hand how many autos they have at the present day. They are used in the conduct of the operations of the company. They certainly have more than five. They are used to haul mains and meters and services, out to the place where they are to be installed, and such service as these trucks perform in those instances is charged into capital account. A proportion of the maintenance of the trucks is charged to [fol. 396] capital accounts.

The company paid dividends in 1923; six per cent on the common stock. On the 8 per cent. preferred stock it was 8 per cent. of the amount outstanding as of dividends dated and the surplus that appeared on the books of the plaintiff company as of December 31, 1923, was after such dividends had been declared. After declaring the dividends the surplus account is always reduced as soon as a dividend is declared, because the status of the stockholder has changed from that of a part owner to a creditor of the company.

In the case of the land taxes we divide it in accordance with the area under lease by the Morse Dry Dock & Repair Company. In the case of the State taxes on gross earnings of public utilities this tax is established because the utility is in the business of serving the public. We therefore consider that an operating expense. If we were not serving the public and we had land leased we would not have to pay a gross earnings tax under the provisions of that particular law. On the Federal income tax no amount is set aside for non-operating expense. We paid the Federal income tax for the year 1922. For the year 1923 if there is any to be paid, it will be paid more than likely one portion of it on March 15th and so on during this year until it is all paid,

but we accrued the 1923 Federal income taxes during the year 1923. We have paid the State gross earnings taxes and the land taxes for the year 1922 and for the year 1923 excepting the last two months of the year 1923 on the gross [fol. 397] earnings tax, because that tax is for a different period, it is not a calendar year period. The special franchise tax was paid—the last time we paid it was in November, 30th, 1923. That was for 1923. The second half of 1923, which ended November 30th.

This statement I have produced here entitled "Analysis of Repairs for the Year 1923," divides the expense of repairs which appears among our operating expenses, between labor, material and contract. That is, those are the repairs as shown in the repair accounts as prescribed by the Public Service Commission. Out of our total expenses for repairs, the labor element amounts to $82,952.66, according to this statement. The material furnished from our stores or purchased directly was $35,775.45. We spent $25,860.16 in contract. That means we had that done, that repair work done by contractors who charged a certain amount, and that included both labor and material. These are the amounts we find in the various accounts under my exhibits already put in, I think it was Plaintiff's Exhibit No. 42—Repairs to Works and Station Structures, for instance, $17,221.45.

Mr. Moran: I will offer it in evidence, in explanation of our repair expenses.

The Master: It may be received and marked Plaintiff's Exhibit No. 52.

(Received in evidence and marked Plaintiff's Exhibit No. 52.)

We will offer in evidence, at the request of counsel for [fol. 398] the attorney general, statement of net increase of meters on district by months, for 1921, 1922 and 1923, showing the increase in 1921 to be 4,029; the increase in 1922 to be 5,665, and the increase in 1923 to be 7,086.

The Master: Received and marked Plaintiff's Exhibit 53.

(Paper received in evidence and marked Plaintiff's Exhibit No. 53.)

This statement is entitled "Average Monthly Working Capital for the Year 1923." The accounts receivable, as shown on the books of the company for each month, were added up and divided by twelve, and the average monthly working capital of $303,988.60 of accounts receivable was arrived at. In the case of material and supplies we did the same thing. In the case of cash we did the same thing.

The amount of cash on hand at the end of each month was added together and the total divided by twelve. Material and supplies is $219,233.80. The amount of cash is $195,142.20. The amount represented on the sheet as gas supplied but not billed was arrived at by dividing the total sales of gas to private consumers by 365 days, and multiplying the resultant by 20, allowing for 20 days of gas supplied but not billed, in this amount. That amount does not appear on our books in that form. This amount was $125,000; the actual amount was $125,000—plus, but we have established it here as $125,000.

The general storeroom expense was the amount carried in that account at the close of each month, divided by twelve after the total. It consists of the salary of the storeroom help and other expenses.

[fol. 399] It includes freight, and so forth, and it is all charged to suspense temporarily until the materials are used. But the average I had in that account that is, the average amounts of money expended for several months, was $12,162.40, invested in that business. And the coal handling suspense is the same thing. That amounts to $649.68. That is the cost of putting the coal in the storage piles and in hoppers and unloading boats. It does not go into operating expenses until the coal is used. Prepaid insurance, $5,837.41 that is the average amount for the year. That money was outstanding to operating expenses and the same with prepaid taxes, $5,358.38. That is the average amount of prepaid taxes.

Whenever we pay a tax before the period for which the tax is chargeable or has been consumed, we charge it to prepaid account and take it out of there as it is consumed. We have a deposit there for performance of contracts. That is $1,000 we have on deposit with the Highway Department of the City of New York for the performance—I

won't say performance—but for the carrying out of the paving. That is for paving purposes.

All materials and supplies that we had on hand, whether they were paid for or not, with the exception of appliances for sale and rental are included. The item material and supplies does include all items whether we purchased them on credit or purchased them for cash.

[fol. 400] (Paper received in evidence and marked Plaintiff's Exhibit No. 54.)

In this first item, accounts receivable, that includes all the accounts that are receivable from the consumers for gas service, from sales of gas.

We bill every day. Every day we send out bills. They are rendered right away and delivered to the consumers, and we request payment on demand, on presentation rather. We endeavor to get all gas bills paid within ten days after they are delivered. We get the majority of those bills ten days after they are delivered, but we do not deliver all of our gas bills at one time and then collect them at one time. The bills for 15 days prior, a great number of them are paid within 15 days, but the bills rendered during that 15 days are still outstanding. So the average outstanding in the accounts receivable is practically the same all during the month.

In the majority of the cases bills are paid within fifteen days, but that does not affect the outstanding. The outstanding are just the same all the way through.

Coal bills are paid usually within thirty days. In the case of coal we usually take thirty days within which to pay for the coal. Gas oil, we take thirty days as a rule. If it goes over thirty days, we have to pay interest on it.

As to commercial supplies, if there is any discount on the bills—any bills that carry a discount, we pay those within the discount period if we have the available cash, in order [fol. 401] to take advantage of the discounts. We have thirty days' credit within which to pay for that coal. Nevertheless, it is in working capital and yet we have, on the other hand, a certain amount of cash on hand received from consumers who pay their bills which the company likewise uses as working capital. If all of the material and supplies—everything was paid outright at the present time,

$195,000 would not be in excess of cash to have on hand to carry on the business. If everything was paid for today, and we had $195,000 on hand as cash for working capital, I would consider that we would need every cent of it.

In so far as the amount of money we received for the payment of those things, that is not a benefit from the consumer, but we would have the benefit of that credit. We have the benefit of the credit, of course. Interest on bank deposits is credited to non-operating. We get the benefit of the credit we have. The company gets the benefit of all credit it has, whether it be in the rate of return on a credit or upon a credit itself. That is, in giving a rate of return, and assuming the Master gives six per cent, he gives six per cent return on the cash that we have received from the consumer and he also gives six per cent on the coal and gas oil and other supplies that we have not paid for. This Plaintiff's Exhibit 54 represents the amount of actual working capital we had on hand as indicated by our books. It does not indicate what we ought to have on hand, but it indicates what we had on hand. That is, it does not involve any opinion of what I think we ought to have had on hand at this [fol. 402] particular time. We do not get any deductions or discounts by reason of prepaying our insurance. We do not get any benefits arising from a prepaying of taxes. In this general storeroom expense we do not get any deductions for cash or discounts for cash. No discounts were reflected in the material and supply accounts. The Master has called my attention to the fact that I have already testified that when we buy things and there is a discount for prompt payment, we take advantage of that; we certainly do. We credit to an account called Undistributed Adjustments all those discounts, and we charge in here the gross amount in every case, they are credited into Undistributed Adjustments and the operating expenses or the fixed capital accounts are reduced by those credits.

An item here of cash $195,142.50, that is on deposit in the bank and in cash in the office. That amount that is in the bank we receive interest on daily balances. That receipt of interest is not reflected in this item in any way. The interest that we are credited with on daily balances is credited to revenue account. That does not appear on any of the exhibits that are introduced here—Exhibit 42 or 49.

The expense of handling the coal from the dock that is unloaded from the boats and delivering it to the stockpile is charged to suspense account and then as the coal is used in the operation of the company we credit that suspense account with a proportionate amount and charge the operating expenses.

[fol. 403] In making up this Exhibit 54 of working capital, I did not take into consideration the amount of money deposited by the consumers deposits. Consumers deposits have nothing to do with the working capital. This is the amount of assets of the company, floating assets of the company that are outstanding, the average amount of floating assets, the floating assets of the company and working capital, that is the capital necessary for those assets whether or not you have any credits on the other side or not. We pay 6 per cent. interest on consumers' deposits. Some of our consumers receive credit. They do not put up a deposit.

Our consumers' deposits as of December 31st, 1923 were $423,020. The interest that we pay on them we charge to Income deductions. It does not enter into operations. It has nothing to do with operating expenses. We use the consumers' deposits in our business. It is probably invested in fixed capital, very likely. It does not lie idle. We carry the amount in the account, and the rest of it is used, and we invest the money. That is we use it to purchase fixed capital or any other purpose that we feel like. We use it for whatever purpose is necessary. It is not an asset it is a liability.

I have heard of this rule of determining the working capital by ascertaining the amount of current liabilities and current assets and deducting the current liabilities from the current assets. It is frequently used in commercial houses, that is, people who are not running utilities, where they buy and sell the commodity used, that is, if they buy [fol. 404] merchandise and sell the merchandise, they use it in that particular case. I say it is not used at all in public utility work.

Mr. Moran: There was produced here, Mr. Hyatt, from the books of the company, a statement prepared by Mr. Gonnoud showing the fixed capital at December 31, 1908, and the fixed capital after December 31, 1908, the latter be-

ing distributed among the several sub fixed capital accounts and also work in progress December 31, 1923. These are all taken from the books. I want to ask Mr. Gonnoud if these figures are not all taken from the books already in evidence.

The Witness: Yes, they are.

Mr. Moran: Now, I offer them in evidence unless you want to offer them in evidence, Mr. Hyatt.

Mr. Hyatt: No, I do not.

Mr. Moran: I will offer them in evidence.

The Master: Without objection it will be received and marked Plaintiff's Exhibit 55.

(Marked Plaintiff's Exhibit 55.)

By fixed capital after December 31, 1908 in this Exhibit 55 I mean, this, That is an account prescribed by the Public Service Commission of the State of New York. They went into being as of December 31, 1908—they came in earlier than that, but in prescribing the system of accounts it was to start as of January 1, 1909, and they prescribed an account called Fixed Capital after December 31, 1908, to take care of all capital additions subsequent to that date. Every bit of fixed capital that had been put in since 1908, is re-[fol. 405] flected in the account called Fixed Capital after December 31, 1908. It is the additions to fixed capital December 31, 1908 to January 1, 1924.

December 31, 1923 or January 1, 1924 that together with the work in progress, construction orders.

Mr. Moran: That of course is perfectly meaningless, that 1908 unless you are familiar with this Public Service Commission and the order made which has already been received in evidence on the 8th day of December, 1908, which is already in evidence, our Exhibit No. 41, which reads like this, just a sentence of it, "Ordered that except as hereinafter provided, on and after January 1, 1909, every gas corporation shall keep upon its books the accounts prescribed or defined in the hereto annexed schedules marked Schedule A and Schedule B, so far as such accounts are pertinent to the facts and circumstances of such corporation." Now, that was on and after January 1, 1909. Then that order provided that you would throw all your fixed

capital accounts after December 31, 1908 in one account and call it fixed capital December 31, 1908.

The Witness: That is correct.

Mr. Moran: And additions after that would have to go into five or six different sub accounts.

Mr. Moran: And a corporation that has issued securities, as this company has, from time to time to get money to pay for their fixed capital, necessarily all those additions made since the 1st of January, 1903 have been checked by [fol. 406] the Public Service Commission, otherwise they could not have made an order to allow the issuance of securities.

The Witness: Yes, they are checked down to March 31, 1923.

Mr. Moran: That is in the case of your company.

The Witness: Yes.

Mr. Moran: I have a statement here that I would like to have marked for identification.

(The paper was thereupon marked Plaintiff's Exhibit No. 56 for identification.)

[fol. 407] This statement was prepared by me. It is entitled "Capital Expenditures, Year 1924 under contract and estimated." That is what it purports to be. We have there, 9,065 meters at $88,873.71. We estimated the amount of meters that we would require for the year 1924, and we have placed orders for that number of meters of different sizes and for that amount of money, with the meter company, to be delivered during the year. That is, since January 1st. Of course this is March and some of them have been bought, many of them have been bought. We installed during the months of January and February close to 1,300 meters, installed on consumers' premises, and those are usually the small months of the year, the winter months. We may require more than this later on in the year.

Last year, 1923, we set in excess of 7,000 meters, I estimated that we will set in excess of 10,000 meters this year, but this is the number of meters we have estimated.

The new holder which Colonel Miller spoke about, to be installed at 65th Street and Eighth Avenue, the contract price is $450,000, plus the estimated cost of foundations. In the contract of course the foundations are not included.

The Bartlett-Hayward Company cannot estimate the cost of foundations at this time, because they have to take borings, etc., and there has to be some sort of an estimate. I suppose they can estimate it, but the contract calls for so much. Booster plant item that is the amount furnished us by the U. G. I. Construction Company, who are doing that work. That is the item of $148,674.96. They give us regu- [fol. 408] lar statements from time to time, showing the cost to date and the amount estimated to complete. That is already under way. We have spent quite a lot of money on it already. Quite a lot of money spent on that is in our 1923 capital, but none of it has gotten into the permanent fixed capital account for 1923. It is in that work and progress statement that went in this morning. Office building, $550,000. That is the estimated cost of that building. The plans are being made now, but no contract has been let on the building as yet. The site has been selected. We expect to complete the building before the close of the year. It will be located between Senator Street and 68th Street, I think on Fourth Avenue, about two miles from our present office. No work has been done, except there is a construction shanty there at the present time with a sign on it. The land has been acquired.

Driving line $150,000, is a line in addition to the present driving line we have from the works to the holder station. We have a line there now about two miles, I think, a 20-inch main. That carried all our gas as manufactured out to the holder for distribution. It is not to parallel it, but to supplement it. This may not run on the same street as the other but it will go out to the holder, but it won't run from the plant to the holder. This will be taken off the present driving line so as to run around and go across a different bridge than we are carrying the present driving line. We are carrying the present driving line over a [fol. 409] bridge and we don't know whether it will be safe or not. It will increase the capacity in this way: We will hook off that line for a greater distribution out in the Bay Ridge District. I cannot say offhand whether that is going to run clean down to the holder or not, that driving line.

I have mains here, 29,869 feet, $152,092.95. We took the number of feet of mains laid last year and the cost of that and figured the contract price of laying the mains last year

and the contract price of laying mains this year, and applied the percentage of increase in the cost of laying the pipe this year to the total cost of laying 29,869 feet of mains in 1923. And from that concluded that this would be the cost of laying the same number of feet in 1924, and that we would lay at least that much. It is an estimate, yes, based on the contract price. The amount laid last year was 29,869 feet, the same as shown on here so I estimated that this year we will lay at least that much and I give the estimated cost of laying a like amount this year. I feel as though we will have to lay at least that much and we do the same thing on the services; 154,816 feet; that is, all different sized services, the same as last year. We estimated that we would have to lay at least that many services. We used the contract price this year. We have a contract this year.

This is not exactly the contract price, but of course in doing that we could not keep any overheads that the company might have in connection with that. What we did was to take the contract price of last year and the contract price of this year, find out what the percentage of difference was, [fol. 410] and we applied the percentage of difference to the amount of money that was carried in that account last year for the installation of those mains and services. The amounts paid on Plaintiff's Exhibit No. 56 for identification are the Company's estimate of the minimum capital expenditure for 1924. There is nothing in connection with the works. These are the minimum requirements we think we will need for the year 1924.

Mr. Moran: I will offer that Plaintiff's Exhibit No. 56 for identification in evidence in connection with the testimony just given by Mr. Gonnoud.

Mr. Ward: I object to the receipt of this exhibit on the ground that it is irrelevant, immaterial and improper. First, it appears that none of this property is now used or usuable by the Company in their gas business, and, further, I object to it on the ground it is too indefinite and too visionary to be used as a basis for finding any rate confiscatory.

Mr. Hyatt: I join in that objection so far as the first ground is concerned, just to preserve my rights, the property is not shown to be used and useful in the plaintiff's

business and therefore should not be included within the rate base to be found by the Court in this case.

The Master: For what it purports to be, I will receive it.

Mr. Ward: Exception.

Mr. Hyatt: Exception.

(Plaintiff's Exhibit No. 56 for identification was thereupon received in evidence.)

I act as secretary of the Board of Directors. The Board [fol. 411] of Directors, I believe have approved the signing of the contract, in connection with the new gas holder. They have passed a resolution, confirming, approving and ratifying the action of the officers in signing the contract for this booster plant. As to the office building they have not passed any resolution affecting the construction of the office building. The driving line is a high pressure main. We did not pass any resolution affecting the installation of that. It is not customary for them to pass resolutions in connection with main extensions and driving lines and services and as to the mains, services and meters, they are installed in the regular course of business. These figures represent the increment of the different developments of the company in the coming year as estimated.

The installation of the gas holder, we need that—we absolutely need that on account of the growth in our business, the business we already have. We are behind in the construction of that gas holder now. In the case of the booster plant, that is to be used to give better service to these consumers, put the gas out on the district. In the case of the office building, we are so crowded now that we haven't any space there, we have to have new quarters.

[fol. 412] Mr. Moran: I offer in evidence a certified copy of an order made by the Public Service Commission of the State dated the 13th day of June, 1923, in its case No. 2559, entitled "In the matter of the petition of the Kings County Lighting Company under Section 69 of the Public Service Commission Law for authority to issue $2,000,000 of 8 per cent cumulative preferred capital stock." This is an amendatory order. It is the last order, I am advised, that the company has had with reference to the issue of securities, and these capital accounts which have been received in evidence in the books up to the date of this order, or up

to March 1923, were checked by the Commission, as shown by this order.

Mr. Ward: I object to the receipt of that exhibit as irrelevant and improper, having no bearing upon this case.

Mr. Hyatt: I join in the objection.

The Master: Objection overruled.

Mr. Ward: Exception.

Mr. Hyatt: Exception.

(Marked Plaintiff's Exhibit No. 57.)

Mr. Hyatt: I have a further objection, may it please your Honor, that the paragraph of the second page of that order marked and numbered 3 in numerals is not of any binding force on this Court and not having any binding force on these defendants, and this represents a determination by the Commission that is not enforceable in this court or controlling upon this court. I therefore move that that paragraph be stricken from the exhibit.

[fol. 413] The Master: Motion denied.

Mr. Hyatt: Exception.

Mr. Moran: I offer in evidence an order of the Public Service Commission of the State of New York dated July 26th, 1923, in its Case No. 1442 entitled "In the Matter of the Petition of Kings County Lighting Company under Section 69 of the Public Service Commission Law for authority to issue $1,500,000 of its 7 per cent cumulative preferred capital stock, which order states the purposes for which the proceeds of that stock may be used, one of the purposes being $495,583.20 of the proceeds to cover the additions unprovided for in the order just received in evidence and the balance of $1,260,000 for new construction.

Mr. Ward: Same objection.

Mr. Hyatt: Same objection.

The Master: Same ruling.

Mr. Ward: Exception.

Mr. Hyatt: Exception.

(Marked Plaintiff's Exhibit No. 58.)

Mr. Moran: I offer in evidence an order of the Public Service Commission of the State of New York dated the 30th day of August, 1922, in its Case No. 108, entitled In the Matter of Standards of Purity, Lighting Power and Heating

Power of Gas and Standards of Measurements thereof In the City of New York and Suburban Territory. That, I might say, is the order which fixed for this company and other companies a standard for a B. t. u. basis for the [fol. 414] production of 537 British thermal units per cubic foot.

Mr. Hyatt: May it please your Honor, I object to the receipt of this proposed exhibit in evidence first on the ground that it attacks the prerogative of the Legislature to fix a standard of quality for gas sold in the City of New York and impliedly claims for its effect a fixation that is controlling upon the Legislature, and therefore it is incompetent, and on the further ground that it is irrelevant and immaterial by reason of the fact that it does not involve any point of issue in this case.

Mr. Ward: No objection.

The Master: It will be received and marked Plaintiff's Exhibit 59.

(Marked Plaintiff's Exhibit 59.)

Mr. Moran: This order just received in evidence covered our operations for 1923 and part of 1922, but some question has come up here as to our operations in 1922, and I want to offer an order of the 25th day of April, 1922, entitled in the same matter which fixed a standard of 535 British thermal units, which continued in force until the order of August 30, 1922, became effective. The case number here is 108-A, but it is the same case, general case. I haven't got a certified copy of it.

Mr. Hyatt: I understand. My objections are not to the form of the evidence presented, but only to the fundamental character of the language contained in the proposed exhibit.

[fol. 415] The Master: It will be marked Plaintiff's Exhibit No. 60.

Mr. Hyatt: Same objection, your Honor, and I presume the same ruling and exception.

The Master: Yes.

(Marked Plaintiff's Exhibit No. 60.)

Direct:

Col. Miller has put in an inventory of our property as of June 1st, 1923 and of course that property has not remained at a standstill since that time. We have added to it considerably. I have made up a statement of the additions for the balance of the year 1923. This statement I produce here. I have here shown the fixed capital additions in the period June 1st, to December 31, 1923. That is the actual cost to the company.

The first column shows the amount that was put in the fixed capital accounts, amounting to $275,996.89 and this figure that is shown of additions in the several months is from the books already in evidence. The fixed capital account was not closed on June 1st, for instance. It is kept there but we can determine from the subsidiary books each separate item shown on this report here. The work in progress that I have here after June 1st, would show on the books. This statement I have here is a compilation of the books already in evidence showing the cost of the additions made after Mr. Miller's inventory was prepared.

[fol. 416] Mr. Hyatt: Well, give me an exception on the ground that items of property are not in the actual service of the company. I object to it as indicating the additions to fixed capital to that extent, your Honor, and not otherwise.

Mr. Ward: Same objection.

The Master: Overruled.

Mr. Hyatt: Exception.

(Marked Plaintiff's Exhibit No. 61.)

The Master: When a prospective customer comes in, who requires some work inside his premises, what process do you follow?

The Witness: At the present time we tell him that we don't do any meter installation work whatsoever, and that he will have to have a plumber put in the heavy work and all the work of hanging the meter under our specification, but we send out our inspectors to see that the work is properly installed, and we furnished the measurements and the location of the meter.

Mr. Hyatt: What is the occasion, Mr. Gonnoud, of taking in any money from the consumer?

Mr. Gonnoud: There is no occasion for that whatsoever at the present time. We don't do it at the present time, but prior to June 1st, 1923, we did take in the money. In that case the consumer came in, and, if he wanted a meter installed, we told him. "All right, we will install the meter, and it will cost you so much money." The consumer then [fol. 417] paid the money, and we credited the amount he paid into the account. That is the actual cost of doing the work, plus the inspection work, and all that was charged against that account, so that the balance represents the actual cost of the work. That was before January 1st, 1923.

For instance, the contractor who does our service work does the work for the consumer beyond the lot line, because it is not practicable to have two different contractors working on the one line. We collect money from the consumer just as an agent for the contractor. It does not go on our books. We put on our books only the expense of collection and the hanging of the meter, since June 1st, 1923.

Mr. Moran: Mr. Gonnoud has produced a statement here entitled "Tar Made and Used by Months, Year, 1923."

By that I mean water gas tar. When I say it is made, I mean it is recovered from the operation, and when it is used, I mean it has been burned under the boilers. That is handled by gallons. It is gallons. The first part is the balance on hand January 1st, 1923, the amount on hand as of that date, at a price of $.0993, and the next part shows the balance on hand January 1st, 1923, at a price of $.0525.

Mr. Moran: Let us have that marked for identification.

(Paper thereupon marked Plaintiff's Exhibit 62 for identification.)

[fol. 418] The Master: Do the figures in the first column, beginning with 204,194 mean gallons?

The Witness: Gallons, yes.

The Master: And all the figures right straight down that column all mean gallons?

The Witness: Yes, sir.

The first section of it shows the balance on hand January 1st, plus the amount of water gas tar produced during the

year, showing the total available to me 551,328 gallons at a cost of $38,293.67. During the year 1922 we used oil, or a good quantity of oil, that cost us 9.93 cents a gallon and we used some more that cost 5.25 cents a gallon. We did not use, however, enough of that cheaper oil to have produced all of the tar we had on hand January 1st, 1923. And so I figured that what was over and above the amount of tar that would come from the quantity of the cheaper oil, was attributable to the more expensive oil. That is correct in a sense, but we do it the other way round. We produced the tar first, and it is charged into the material and supplies account at the price of the water gas oil from which the tar is produced. Then we exhaust that quantity, use it until we use it up—until we have used all of the same price tar, and then we go to the next price of tar. The tar is pumped from the settling well up to the tar banks. Then we know how much we use and this is the measured quan- [fol. 419] tity, the exact quantity used in 1922. The item there of $25,969.21 does not agree exactly with the amount shown on Plaintiff's Exhibit 49, due to the fact that we have a handling charge of one-tenth of one per cent., amounting to $35.96. One tenth of one per cent. of the cost is what we use for the handling of tar and water gas oil, and that amounts in this case to $35.96. Adding that to the amount shown here, it will come into agreement with the amount shown on Plaintiff's Exhibit 49, and that is what I understand Mr. Ward wanted to do—tie in this amount with the amount shown on Plaintiff's Exhibit No. 49. This tar was used in 1923, and we ran it along at an expense of 9.93 cents a gallon down to—July, part of July. Then I dropped to that lower price. The balance on hand at the close of the year was 15,778 gallons, at a cost of $749.45. In other words, all the water gas tar produced in 1923, together with what was on hand, was used during the year 1923 with the exception of that amount. Our expenses are not affected by the fact of whether we accumulate tar and have it on hand or use it up as we go along—We used it under the boilers for producing gas, making steam, which produced gas in turn, and for other purposes. It takes the place of a certain quantity of other fuel; but we use other fuel. I could compare the cost to the company of fuel, the comparative cost, as between gas tar, coal and other things.

[fol. 420] I have done some work on it, but it is usually done by the engineer of the company, who has to determine the efficiency of the materials used. In other words, when we use water gas tar it is a substitute for other fuel; it is a substitute for other boiler fuel, in other words, if we had not used as much water gas tar as we used, we would have to use other fuel to take the place of it.

By Mr. Ward:

Q. Mr. Moran asked you a question if it made any difference in your operating expenses if you had a supply of tar on hand or whether you used the tar as you made it, and you answered that it doesn't make any difference. That is only true if the price of oil remains stationary: isn't that true?

A. No.

Q. If you have a supply of tar on hand that is made from high priced oil, and the price of oil goes down, your operating expenses while you are using that high-priced tar will be higher than if you used the tar made from low priced oil, wouldn't it?

A. Not if we used the tar produced from the low-priced oil. If we used all the tar produced at the low price, produced from the low-priced oil, as we did in this year, 15,778, that settles that part of the question. The balance of it is that we used water gas tar at the higher price of 9.93 cents a gallon in place of other fuel that we could and would have [fol. 421] to use in case we didn't use that.

Q. Yes, but you have not testified that tar is as economically used as coke, have you?

A. I haven't testified that it is or is not.

Q. That would only be true if coke and tar were the same price, for making steam?

A. No, there are other factors entering into that. If we could not dispose of the water gas tar—well, there are several other factors entering into it, where it would be more economical for the company to use water gas tar regardless of the price that is charged into the operating account.

Q. It is a fact that on January 1st, 1923, you had on hand a large amount—that is 204,000 gallons of very high priced tar?

A. I won't say very high priced, because we have had tar——

Q. Over twice what your tar costs now?

A. Yes, over twice what the tar costs now.

Q. And during 1923 you used up all of that high priced tar and all of the tar that you manufactured during the year, except 15,000 gallons?

A. That is true.

Q. And in that year your operating expenses for 1923 are higher than they would have been if you had not had on hand all of that high-priced oil,

A. No, because we used that high-priced oil, as you call it—high-priced water gas tar, we used that for the production of gas. If we had not used that for the production of [fol. 422] gas, we would have had to use other fuel of a similar nature.

Q. Well, do you mean to testify that it is just as cheap your company to manufacture steam from tar at 9.93 cents a gallon, as it is to use coke?

A. I could not testify as to that. I don't know whether it is or not. I don't know that it is.

Q. But if it is cheaper to make steam from coke than it is from tar at that price, your expense for 1923 are higher because you had that amount of tar on hand; isn't that true?

A. Well, there again you must consider the utilization of the tar versus the utilization of the coke, and it does not all depend on the price of the tar and the price of the coke or the efficiency of both. We might have been put to the expense of discarding all that 204,000 gallons during that year?

Q. Yes, but you did not discard it, you charged it up at practically ten cents a gallon.

A. That is correct.

Mr. Moran: Now, I will offer that in evidence.

The Master: It may be received and marked.

(Plaintiff's Exhibit No. 62 for identification was thereupon received in evidence.)

Mr. Hyatt: Mr. Moran, in view of what Mr. Ward has just asked, are you willing to let the record remain as it is in regard to Mr. Gonnoud's testimony as to the operating

expenses not being affected at all by the quantity of water [fol. 423] gas tar on hand?

Mr. Moran: I think it is obvious that they are now *now* necessarily affected by the fact that you have tar on hand at a higher price and carried over. As the witness has stated, it is rather to be determined by the cost of other fuel in the 1923 expenses, and other considerations which he has mentioned; but the mere fact that you have carried it over at a higher price in 1923—that doesn't necessarily mean that your expenses are higher, had you used the tar made during that year.

The Master: Let me ask this question. Is this gas tar a residual from the oil used in the making of gas?

The Witness: It is.

The Master: And the cost of water gas tar which you have put down here has a direct relation to the oil?

The Witness: It is exactly the same price.

By Mr. Moran:

Q. Then do you mean to say that high priced tar there is what was recovered when the oil contract was in effect, dated March 8th, 1921?

A. That is true.

Q. And that is the oil contract you had in effect at that [fol. 424] time?

A. Yes.

I was asked about how I kept our expenses for materials that came in under contract. We had contracts for oil, coke and coal during most of that time. We had a contract on generator coal and water gas oil, and this contract ran into 1922. For oil, 1922 and 1923.

Mr. Moran: Well, I will offer that in evidence. That is our oil contract for a part of 1921 and a part of 192-(?).

Mr. Hyatt: No objection.

The Master: That may be received in evidence and marked.

(Paper received in evidence and marked Plaintiff's Exhibit No. 63.)

The contract you have just shown me is the contract for oil that succeeded the one just received in evidence. That

brought our supply down to—November, 1923. It is on that contract that I audited the bills which appear in our operating expenses for 1923.

Mr. Moran: I offer that in evidence.
Mr. Hyatt: No objection.
The Master: It may be received.

(Paper received in evidence and marked Plaintiff's Exhibit No. 64.)

That last contract just received in evidence brought our [fol. 425] oil company down to November, 1922, and we have continued making gas and taking oil since that. We get it under the terms of this contract. That is the one we are getting oil under now, since November, 1923. The price is 4.75 cents. These two other contracts received in evidence were with the Standard Oil Company of New York, and this is the Standard Oil Company of New York.

Mr. Moran: I offer that in evidence.

(Received in evidence and marked Plaintiff's Exhibit No. 65.)

Our coke is under contract. This contract you show me, dated the 27th day of March, 1923, between the Seaboard By-Products Coke Company and the Kings County Lighting Company is the contract that covers the greater quantity of the coke used in 1923. The contract runs from April to April. That coke is used—that is in use for boiler fuel. The coke takes the place now of what we used to use, anthracite and broken coal in the generators. It is purchased for that purpose.

Mr. Moran: I offer this in evidence.
The Master: It may be received.

(Received in evidence and marked Plaintiff's Exhibit No. 66.)

The coke year is from April to April, and the last contract received in evidence covers from April, 1923 to April, 1924. That is what we are getting coke under at the present [fol. 426] time. There are no contracts for coke beyond 1924, not as yet. That one runs from April, 1923. These letters that you show me here express the contract that we

had for the purchase of coke prior to April, 1923, for the year prior to that—April, 1922 to April, 1923 between the Seaboard Biproduct Coke Company and the Kings County Lighting Company. They are three letters, one a proposition made by the coke company to the lighting company referring to an interview between the officers of both companies. And the acceptance of that by the Lighting Company, and a further acknowledgment of the receipt of the acceptance by the coke company. They are all dated in April, 1922.

A. Yes, sir.

Colloquy Between Master and Counsel

Mr. Moran: I offer these three letters as constituting the understanding or agreement under which the company received its coke for the coke year April, 1922, to April, 1923.

Mr. Hyatt: No objection.

(Three letters marked as one exhibit Plaintiff's Exhibit No. 67.)

Before that we used broken anthracite coal.

Mr. Ward: Exhibit 39 was offered and was not received. I stated at that time that I had an objection that I wanted to make to its receipt. If I can make these objections now——

The Master: What was that, Mr. Ward?

[fol. 427] Mr. Ward: Col. Miller's long exhibit.

Mr. Moran: His inventory.

Mr. Ward: I have a lot of objections to that exhibit and I might read them into the record now.

The Master: Yes, you might read them into the record now.

Mr. Ward: I object to the receipt of plaintiff's exhibit 39 for identification on the grounds that it is irrelevant, immaterial, incompetent and improper for the following reasons:

1. That this exhibit inventories and appraises certain property and it has not been shown that such property is used or useful by the plaintiff in manufacturing or furnishing gas to its consumers.

2. That this exhibit purports to give the reproduction value new of certain property and that reproduction value new without a deduction for accrued depreciation is not a proper element to consider in a proceeding brought to have declared confiscatory a rate for gas fixed by a state legislature.

3. That the exhibit contains values for land, buildings, street mains, special material, services, and meters, which values were fixed by other witnesses, and such values were received over the objections of the defendants and we agains object to their receipt in this exhibit.

[fol. 428] 4. That this exhibit contains an estimate of the cost of installing the number of meters that were on the company's territory May 1, 1921. That it affirmatively appears at page 1262 of the record that on that date, May 1, 1921, the company discontinued the practice of paying for the installation of meters. That therefore in a reproduction valuation such an item has no place. Reproduction cost is a theoretical cost of replacing the plant under present practices and prices and if under present practices the cost of installing meters would not be borne by the company such cost cannot be included in reproduction value. This is conceded by the plaintiff for it has not attempted to include a price for installing all meters but has confined itself to only such meters as were installed prior to May 1, 1921, thus presenting to the Master a jumble of discontinued practices and reproduction costs.

5. That pages a-g of this exhibit contain what is in reality an essay on "Working Capital" and on that is designated as "Undistributed Structural Costs." That the only attempt made to apply the statements contained in these pages to this particular case is by the insertion of certain figures; that the balance of the statement could be used with equal force in any other rate proceeding. The statements contained in these pages should be brought out by questions and answers, thus allowing the defendants an opportunity to object to those parts they consider irrelevant or improper rather than to receive all of these matters in bulk and thus introducing much improper and objectionable evidence. [fol. 429] These pages go much farther than statements by

the witness of what he has done in this particular case, but contain most general statements of his theories that have no relevancy here. In addition to the general objections to pages a-g special objection is made to the following items therein contained:

Under the Heading Working Capital

The first paragraphs under the heading "Working Capital" contain general statements of the witness of what in his opinion should be included in working capital, and the last paragraph states, "I have taken the average working capital being used by the company during the year 1923, which was determined by averaging the monthly balance was $855,227." This figure was adopted by the witness in his general summary sheet. No evidence has been produced to show that this is the proper or correct amount necessarily used by the company, and as the witness has adopted book figures his dissertation on working capital is improper and irrelegant.

Under the Heading Omissions and Contingencies

Under this heading the witness set out certain elements which he says he believes should be included in these items. He then gives a lump to include all of these items. This sum is not broken up and apportioned to the different elements and its receipt by the Master would force the defendants by cross-examination to bring out facts that are part of the plaintiff's case and should be presented and proven by it. A typical example of the improper and irrelevant matter scattered through these pages is contained under [fol. 430] this heading where the statement is made (page c) "every contractor, builder, vendor of machinery, and every businessman of experience knows, etc."

Under the Heading Organization and Development Expense Prior to Construction

It is not clear how the witness arrived at the sum estimated by him for these items. He says, "from the whole situation with respect to this company, I am of the opinion

* * *." If he means by this that the actual expense of the company is used it is obviously improper as none of the records showing such preliminary expenses are in evidence. If he means that it is based on the general history of the company it is equally objectionable as it has not been shown that the witness has ever made any investigation of the early history of this company.

Under the Heading Cost of Financing

Under this heading general statements equally applicable to any corporation are made and from the air the witness picks a certain sum which he says would cover all these elements. No division of it is made among the different items and its receipt in this form would throw an unfair and improper burden upon the defendants. As again showing the obviously improper statements in these pages, the attention of the Master is called to the following statement under this heading: "Every person who has had an active part in the floating of a construction enterprise in the public utility field in recent years knows * * *." A further objection to this item is made on the grounds that it has not [fol. 431] been shown that this witness is qualified to pass on the cost of financing a new enterprise; his experience is that of an engineer in the planning and construction of gas plants, and, although he may know that certain expenses of this kind are necessary, yet he is not qualified to estimate the exact amount that would be required on a definite date.

The same general procedure is followed under other headings and we again urge upon the Master that the receipt of this exhibit in this form would place upon the defendants an improper burden that they would be forced to bring out by cross examination many facts that are rightfully part of the plaintiff's case. That this exhibit is an attempt to insert in the record a mass of improper and irrelevant matter.

The courts have laid the greatest emphasis upon the quality of proof that must be adduced by those who assail a statute as unconstitutional and this exhibit cannot be considered as being so unequivocable and convincing as to come within this rule.

Mr. Hyatt: I join in that objection, if it please your Honor, to the proposed exhibit on the grounds enumerated

by Mr. Ward, and also have to add thereto, your Honor, that there appears throughout the proposed exhibit a number of statements that are argumentative and not necessarily facts. This one that Mr. Ward just used, that "Everybody in the construction business knows," and so forth—I believed he quoted that. There are a number of argumentative statements.

If the witness knows about a certain state of facts, let [fol. 432] him set forth the thing in an affirmative statement; but to present the matter in the shape in which he does in many cases is only argumentative and should not receive any consideration on that account from the Special Master.

Not only that, but in examining Col. Miller on his estimates, I never understood why he incorporated working capital in one of his exhibits; more particularly for this reason:

His estimate involves a sum of money necessary to be spent in order to reconstruct and replace the plant as of a given date. Now, invariably, he testified that it would take a period of time when that plant would be completed. For instance, in this particular case he estimated that it would take two years to complete the plaintiff's plant. That being so, there is no working capital necessary to be had.

I do not deny that the plaintiff's are entitled to working capital as a part of their rate base here. I do not mean to insinuate anything of the kind; but I do say it has no part in this method of determining the value of a plant on a reproduction cost new basis, because there is no necessity for the existence of any working capital until the plant is ready for operation.

Now, if the plant is not to be ready for operation, for two years, whatever estimate is made as to the necessary amount of working capital may necessarily be wrong because no one knows what it will cost to buy a ton of coal two years hence; what it would cost to buy innumerable other things that are now included in working capital; and [fol. 433] it seems to me it always is a kind of misnomer to include in any part of this reproduction cost new method of valuing a plant the working capital, because, if the assumption is carried out, the expert invariably sets down—

that is, with reference to the period of time necessary to reconstruct the plant, it always involves a period of time in the future when no one can prognosticate what the cost of these actual materials may be; and it seems to be more or less of an absurdity to incorporate, by reason of these conditions, working capital in replacement cost new. So I add that to the objections already interposed by Mr. Ward as one for your Honor to consider in this connection.

Mr. Moran: Of course, they are not included in reproduction cost.

Mr. Hyatt: It has a kind of prejudical effect.

Mr. Moran: Don't you understand that they are not in the reproduction cost new of the fixed capital? They are not. They might just as well be separately some place else.

Mr. Hyatt: Well, we will take that view of the case, then, Mr. Moran. Now, take this page here in which Mr. Miller summarizes the entire thing, working capital. Now, it ought to be distinctly understood by the Special Master that it has not any essential connection with the reproduction cost new. Heretofore, Colonel Miller's basis has been to determine working capital on the number of thousand cubic feet of gas sold at 50 cents per thousand. Now, I do not know whether he has followed the method that he usually follows in this case.

[fol. 434] Mr. Moran: He has taken the company, the records of the company that were carried on. Mr. Gonnoud has supported it today on the stand.

The Master: I will overrule the objection and admit the exhibit.

Mr. Ward: Exception.

Mr. Hyatt: Exception.

[fol. 435] Kings County Lighting Company

PAUL BUCHER

Direct:

My resident address is, 537 Senator Street, Borough of Brooklyn, in the territory of the Kings County Lighting Company. I am a customer, one of the fifty thousand and an officer of the company. I am Vice-President and treas-

urer. I have been connected with the Company since September 15th, 1917.

I first started as the rate case statistician, and I think the following May I was made assistant treasurer, and, to the best of my recollection, in the fall of 1920 I was made treasurer, and about a month or two later second vice-president, and the following spring vice-president and treasurer. The president of the company is, Ralph Elsman. For the last couple of years I have been vice-president. There are two vice-presidents, the other one is Mr. Dickey. I take the place of the president in his absence, in the management of the company. My office is out there at 48th Street and Utrecht Avenue.

I was connected with the gas business before my connection with this company, for a number of years. I first started in 1905 with the Westchester Lighting Company, in White Plains, and have been in it ever since. I am a graduate engineer from Lehigh University, electrical engineer in 1898 and have practiced my profession ever since 1898 in the gas and electric business. The gas business began in 1905. I am familiar with the property down there. The mains of the company, are located on streets where the company has its customers for gas. The force mains and transmission mains of course are used to carry the gas [fol. 436] to the distribution mains and the holders.

We have distribution mains and we also have transmission and driving mains or high pressure mains for getting from the works to the holder or distributing from the holder for utilization by the consumers, and they use all of them. There is no question about that in my mind. The meters are on customers' premises, or in stock, to be available for use. We have got no more meters there than we need. We use holders out there in the daily operations for the purpose of storing gas in order to insure the continuity of service to the consumers. It is necessary to store gas. You have to have holders on every system of distribution. You cannot get along without them. The shop and stores room out at 68th Street and Ninth Avenue is in use. That was built before my time. That is all in use, and has been all of the time I have been with the company. It is necessary for use.

As to the land, the company bought a portion of land out in the vicinity of 65th Street and Ninth Avenue in the early

years of the company with the idea of having adequate facilities for the growth of the company's business, includ-[fol. 437] ing holders and distribution, shop, storage of material and incidentals which they would not possibly forsee at that time. The City unfortunately determined to put streets through our property, and they took away I should say the major part of the property, leaving us comparatively small parcels except for a considerable portion of the block between 66th and 65th Streets and Eighth Avenue and Ninth Avenue, on which our holders are. It didn't leave us the whole of that. We do not run up to Eighth Avenue. That is the largest plot of the ground we have. The City did not take that away from us. They took away all the area by the streets in that Bay Ridge Parkway, Ninth Avenue has not actually been opened since we bought the property. It has been for all purposes, so as the map goes. It is legally open. They left us that block which I spoke of between 65th and 66th Streets, parcels, A and B, on Exhibit No. 28 where the distribution shop stands. The large parcel is D and E between 65th and 66th Street. We need that for the present holder contract of course, the proposed holder contract. I need all of that.

The booster house is right on this corner (indicating) The booster house is on the E property and the 500,000 is on the Ninth Avenue and the 2,000,000 is adjacent to it. Those are on parcels Nos. D and E. The new plant is to go on the D portion and part of E. The 5,000,000 foot holder is what I am going to put up there and that takes a whole block in width, 200 feet in round figures, in diameter 198 feet. It takes the whole block in width parcel C. is used for storage material and F is ungraded. I do not store any-[fol. 438] thing on that at the present time. G, H, and I are used for the storage of material. We have all materials stored on D and E, but on account of the fact that they are going to be used for the holder we transferred to G, H and I. I need that land for those buildings and holders out there, the holders are used every day.

People go in the shop building to get meters and take them out and all that sort of thing. They need additional space there. There is no building on C, D, F, G, H and I. But the holder is going up on D and part of E. I use C for storage of material. The one just south of that is

F. That is at the present time ungraded, but we are simply waiting for the City to cut through the street so that we can have the work done at the same time in order to utilize our property for the storage of materials, because the present place where they are stored namely Parcels G, H and I is too far away from our shop to have it under constant supervision. That is a temporary use I am making of this place for storage on account of the fact that junk men have no great recognition of ownership, and that material is valuable to them as they term it for junk.

At the works down there at 55th Street I have an office and meter building. People work in that building. The contents of the building are the wet drum meter foundation on the first floor and also the housings for the Thomas meter; there are also cupboards down there for the use of the janitor for cleaning up around the building; there is also the time clock for all employees coming in and out of the works who have to ring in and out; and the same works [fol. 439] there is also the Wiley proportional meter of about 160,000 cubic feet per hour capacity. On the second floor there is the wet drum meters, called the Hinman drum meters, of about 77,000 cubic feet per hour capacity and the registrating and control mechanism of the Thomas meters; the desks of the works superintendent and several clerks are also located in the same room with the meters; alongside of that there is a locker room, wardroom, toilet for the heads of the production department, the engineer, assistant engineer and the cadet engineers and the foreman and the superintendant; on the third floor there is the chemical laboratory where we analyze the coal and oil received, the gases, also a calorimeter, a Yonkers talorimeter for ascertaining the B. t. u. content of gas, also a Cutler-Hammer calorimeter, recording calorimeter, so that we can see at a glance exactly what the operations are of the day. Adjoining that there is a bathroom, or adjoining that I should say first is a room in which we have a jet photometer, bar photometer which is in service, and can be used at any time we desire to make a test in regard to the candlepower of the gas. Alongside of that room is a room that can be used in case anybody gets sick and wants to lie down, although we do not at the present time utilize it for that purpose, but it can be used; and alongside of that is a bath

room in which we wash our blueprints, and there is also a toilet and lavatories. There is only one more room, and that is the engineer's room and the chief engineer's room and drafting room. Those are the people that are employed [fol. 440] down there in their several capacities who need forts that the officers of the company would like to extend such a place to work; they need that and additional room. We do not afford the facilities to our men for their com- to them.

That building is pretty well occupied and absolutely used in the gas business. I could not get along without it very well unless we provided some other place for the same amount of equipment.

No. 2 generator house, houses four gas-making sets. No. 1 houses three gas-making sets. The 8 foot 6 sets in the No. 1 house have a capacity of 2,000,000 feet a day each, 2,000,000 for twenty-four hours; the Williamson sets—no, I will increase that capacity. The three 8 foot 8 sets have a capacity of 2,400,000 a day, and the Williamson machines have a capacity of 2,000,000 a day, the 11 foot 6 sets, the U. C. I. sets, have a capacity of 4,000,000 a day. We need those generators to make gas. They are what are commonly used to make gas. We have no excessive housing space there. I have no room for installation of additional sets in those buildings.

I am filled to capacity so far as those buildings are concerned but I could extend the buildings to put more in, but the present buildings will not allow for the installation of more sets.

At the time of peak load we have had all five machines on, the five U. C. I. machines, leaving the two Williamson [fol. 441] machines for stand-by. That is not a good operation condition to depend absolutely on all five machines, you always have to bank on having one of those machines down for overhauling and repairs, so that if one were down at one particular time we would have one of the Williamson machines in use, which would leave that one Williamson machine for a stand-by in case anything should happen. The two Williamsons have a capacity of about 4,000,000 a day. Our highest send-out of gas a day, to the best of my recollection, is 8,336,000.

The figures I have given are the capacity, the rated capacity of the machine for 24 hours. To answer your ques-

tion you would have to go on a different basis, as to what our maximum capacity is per hour over a period of time when our send-out is up at a maximum, as, for instance, on Sunday, and also taking into consideration the holder capacity, that if we had such a small holder capacity that we had to depend absolutely on the rated capacity of the machines to do the work, we will have to have a rated capacity of those machines at the present time of about one million feet an hour, but with a larger holder capacity where we have some storage so in case anything should happen we would have a little time to fix it up, we could get along with a less rated capacity per hour. I cannot recall the highest hour now, but, I do not recall of any hour going above 745,000.

I am not stocked up on generating capacity, that is, we don't claim we need more generating capacity, in fact we have had to put in more than we otherwise would on account of our small holder capacity, so we have generator [fol. 442] houses Nos. 1 and 2 and seven machines in service. We have boilers, of course. We are running them all at certain times, depending on various conditions there, we have them all in operation at one time or another. I have not any excessive boiler capacity in my judgment, at the present time. We have enough provided the waste heat boilers on the two U. C. I machines continue in operation; but if one is down for repairs and anything should happen to the other machine, or any part of that machine, we might have to shut them down entirely because all the waste heat boilers would be out of operation and we would have to utilize all the boilers in the boiler plant. We have to be prepared at all times to meet an emergency like that.

The boiler house is not too big Not much floor space for any new boilers without ripping out the boilers that are in there now and putting in others. I could not put another boiler in that boiler house. Another boiler is absolutely required in the extension. We have two oil tanks, one of 500,000 capacity and the other 250,000. They are absolutely used every day. We have two purifying houses. They are practically almost one building; they are built at different times, but we call them the old and the new purifying houses. They are used. I haven't any purifying house that is never used.

There are two condensers and two scrubbers in No. 2 generator house. We have one condenser and one scrubber that is still in use, and the others are for standby purposes [fol. 443] and can be used in case of emergency. They are still connected, and can be used in case I want to use them. I get our coal in there in barges and run it on the trestle up there. That is a good way of handling it. It is much better than wheeling it up in a wheel-barrow. That is absolutely necessary.

We have two holders, the relief holder of 100,000 cubic feet capacity, and the commercial holder of 100,000 capacity. They are used every day. There is no property down at the 55th Street plant that is not used. I have there what is called a toluol house. We are not making toluol. We are using that house as a filing building for the records of the company. We have converted it into a storage space. It is fire-resisting, built of brick and steel. It is a suitable place for storing our records and is something we need. We could not, just as well have our works located up there at Ninth avenue and 66th Street, because it would be a more expensive proposition to get in material and supplies. It would not be economical on account of the fact that material and supplies would be more expensive to get in there. We have got to be on a railroad or on navigable water, for a gas plant of any magnitude; it is almost necessary to be on the water front or where the water front is available.

[fol. 444] If I was using coke instead of anthracite coal, I would need to be on the railroad. It is not like the electrical business, I don't need the water for condensing. I don't use the salt water in the making of gas like they do. It is simply a question of transportation facilities and Brooklyn hasn't got very many railroads that run to coal mines especially so I have to be on the water front. There are no gas plants in Brooklyn that I know of that are not on the water front.

Other gas companies seem to think it is best to be on the water front. Of course by water front I mean the bay or Gowanus Canal or other canals or creeks. I mean they have a water connection for transportation, navigable water. The Brooklyn Union plant is at Gowanus Canal, and the Brooklyn Boro-gh is on Coney Island Creek. We lease a

part of our land there to the Morse Company. For the present, we could just as well get along without that, but our plans for the future require that we have that land back again. That is, our plans for the development of the company. Increased facilities of the company make that necessary, on account of the enormous growth of the company's business. I mean for additional generator business—increased facilities for turning out an increased production of gas.

We do not have any trouble getting our coal in there on account of the Morse occupancy of our land. Requests on our part are necessary at times, in case we have several coke boats or oil barges coming in at one time or that might happen to be there at one time. We might have to ask them [fol. 445] to shift their boats tied alongside of our dock or bulkhead, and they are always very accom-odating. They do not interpret their lease to the effect that they can exclude us from any part of the waterfront. They always act in a very neighborly way, not as landlord and tenants usually do. For the present uses of our company, that is just as good as if we had our waterfront; I mean up until the present time. I have not examined Colonel Miller's inventory. I glanced over it. I have not checked it up to see if he has things in there that I haven't got. I am depending on Colonel Miller to get everything in.

The property that I have just testified to at 55th Street and the waterfront at 65th Street and Ninth Avenue, is the same property which was visited by counsel and the Special Master in this case, except that I don't think I showed these lots across the Parkway at 65th Street that are known as Parcels G, H and I on Plaintiff's Exhibit 28.

[fol. 446] Kings County Lighting Company

Brooklyn, New York, March 13th, 1924.

ALTEN S. MILLER

Cross:

In connection with Plaintiff's Exhibit No. 39, I first visited the plaintiff's plant in June, 1923. Of course I visited it many times previous to that, but in connection with this particular work I visited it in June last.

I testified in the case entitled Kings County Lighting Company against The City of New York and others, on or about the 1st of December, 1918 before Judge Greenbaum of the New York Supreme Court and at that time I prepared an exhibit similar to the one presented here, showing the reproduction cost new of the Plaintiff's property at that time for that court; similar as far as this one goes. I valued the buildings in that case as well as the equipment, and that exhibit included the buildings and equipment, and the mains and services. This exhibit does not include either the buildings or mains and services, except in toto, as testified to by other witnesses.

On the occasion of my first visit in connection with this inventory, Plaintiff's Exhibit No. 39, I remained at the plaintiff's plant several hours during the day that I first visited it. I was accompanied by some of my assistants. They did not specifically list up individual items at that time, but they went through with me so that I could tell them what was used and useful and tell them what to take and what not to take, leaving out those articles which were not used and useful. I don't recollect whether my assistants stayed after I left, or left with me. I don't remember at the moment. I don't remember on how many occasions [fol. 447] after that in connection with the preparation of this inventory I personally visited the plant, two or three times. I have been familiar with this plant for over twenty years, and don't have to go very often. I did not remain at the plaintiff's in connection with the work of this inventory, for more than a single day. After this first visit in connection with the preparation of this inventory my assistants began the work of surveying and listing the items of property. I think that it is possibly the next day. I am not quite sure about that. I don't know how many days they remained there making their survey. I don't know how many of my assistants were engaged in the work of making the survey in the plant, two or three or four. They consumed all the necessary days in the work of listing these items of property appearing in this inventory marked Plaintiff's Exhibit No. 39. I don't know how many, the list is here.

In the first place the list was checked by me, item by item, to be sure that it was correct. I did that after the list

was made up. I don't remember what time. I have made and checked up 25 plants in the Metropolitan District, and I haven't any remote idea of the dates I checked up each one, and this was one of the first ones, so it will be along last summer some time. This was the first inventory that I completed, and I checked every piece to see that it was there and being used for the benefit of the public. Then I turned it back to my associates, having first arranged for a letter to be sent out to the people who furnish the class [fol. 448] of apparatus that was there, having arranged for complete specifications to be sent to my own estimating department in Baltimore. Then those letters were written, asking for present manufacturers' prices on these various pieces of apparatus, and my Baltimore estimating department checked up such apparatus as was furnished by my company. When the answers to those letters were returned, I checked up the prices that were given in those answers with purchases that had been made by my company and by other companies in the Metropolitan District, to determine whether they were right or whether they were not right. When they were not right, I checked up and substituted the current market prices determined by purchases. When they were right and properly accountable with current market prices in my opinion, I had my staff apply them. Where computations were necessary, the computations were made on the machines. The totals were then drawn off on adding machines. The computations were checked by me in various places, to assure myself that they were correct, and the totals were then put in or written up in final form as indicated by Plaintiff's Exhibit No. 39 in this case.

The form in which it is presented here was prepared in the Borough of Brooklyn; more specifically 176 Remsen Street. An office building is located there of the Brooklyn Union Gas Company. I stated that I checked up every item of property appearing on this inventory to determine whether or not it was used for the benefit of the public. I [fol. 449] did not make any survey of the distribution system. I did not make any valuation of the distribution system, except the meters. I did not make any survey of the meters, I examined the meters that were in the stock, but I did not make any survey of the meters on the district, except to see a few of them. I made a survey of the piping

that was in stock. I did not do this work of checking up in a single day. I should say that all the time I put on checking up the question of its existence or being used and useful property, took a couple of days. I had previous experience, a great deal of experience on this property, and I just checked up my experience in about two days.

The boilers and water gas machines have a good deal of brick in them. The Bartlett-Hayward Company manufactures generators and sells them. They manufacture holders and sell them. They manufacture purifiers and sell them. They do not manufacture boosters. We buy them and sell them when we have a contract which includes them, but we do not make them at all. We do not manufacture pumps.

The items in this inventory which the Bartlett-Hayward Company do not manufacture and sell, so far as my recol- [fol. 450] lection goes—are the running machinery of any kind. That is, engines, exhausters, pumps. They manufacture very little cast iron pipe. They do manufacture some. They do not manufacture any steel pipe. They do not manufacture any of these gauges. They do not manufacture boilers of the type that appear in this inventory, but they do manufacture a certain type of boiler. They do not manufacture these traveling stokers or steam-flow meters or recording thermometers or water meters or fixed water heaters or draft gauges.

In preparing an estimate of this kind, to determine the value of any particular piece of property and the cost to reproduce that piece of property I wrote to the manufacturers to get a price, which price I checked up with other purchases. The price was not entirely determined by the answer I got.

Securing the price from the manufacturer, I compared it to other prices with which I was familiar of similar apparatus, actual purchases, and if the price was in line, I used it; if it was not, sometimes I went back at the manufacturer, and if it was an important item, to be sure that he understood the original specification I had given him. Sometimes there were misunderstandings of the specification and the price given on a piece of apparatus of a different specification. When his attention was called to the correct specification, I generally got the correct price, which I used. But I tested every price.

I testified that I was also preparing estimates of the reproduction cost new of items of property in several other gas plants than those of the plaintiff within the last year. [fol. 451] None of the unit prices that I used for the plaintiff, where the apparatus is the same, differs from the unit prices that I used in connection with my inventory for other companies' property. The unit prices, for instance, that I adopted for a Worthington pump for the plaintiff would be just the same as the unit price for a Worthington pump for the Brooklyn Union Gas Company, if it were the same size and specification; or the Consolidated Gas Company or any other company in the City of New York, if it were the same size and specification, and if the cartage were the same. There is some going out to outlying companies in some cases where the delivery cost is slightly greater, but the delivery cost to the Kings County Company is as low as any other in the Metropolitan District.

The unit prices shown in Exhibit 39 show the article installed. A Worthington pump can be bought in Harrison, N. J., and these gauges, some of them can be bought in New York, and some cannot. Some of them can be bought in Brooklyn. The American Steam Gauge Company, I think, has a plant in Brooklyn. There are two pump companies in Borough of Brooklyn. I do not think that anybody in New York makes blowers. Of course you can buy them delivered, but I do not believe that there is any blower manufactured—I don't know of any—in New York City. No stock, no appreciable stock is sold here. There may be a few odd sizes you might pick up, but I am quite sure that [fol. 452] that there is no stock of blowers such as we use in our business in the Metropolitan District. I take it that every item that I have here would be purchased in New York, but would not be in stock in New York. The Westinghouse motors would be shipped in from Pittsburgh. In purchasing those I estimated that they would be shipped from Pittsburgh, because when you buy anything from stock you always have to pay more for it, and the lowest cash price was used for them, which meant shipment from the factory.

In valuating the holders I had to take into consideration that those are fabricated in Baltimore, Md., that is the way the estimate was made. We do not make the plates. We buy the Plates. The holes are punched according to our

own drawings, and the riveting is done in accordance with our own specifications and drawings, such riveting as we do. There is quite a considerable amount of riveting done in Baltimore, then there is a good deal of fabrication, a good deal of blacksmith shop work and structural work in connection with it, which is done there. We have special equipment, special dies so as to bend up the bent parts, certain parts that are bent by special dies and under drop hammers.

I always have a given size for a given size holder, for instance, I have to give a certain curvature to the plate, a curvature determined by the relation of the diameter to the circumference. It is the circumference of a circle of a specific diameter.

[fol. 453] There are very few people who can build a good holder, if that is what you mean. It takes long years of experience not only engineering but expert building to build a smooth holder. There are very few people can build an area of light sheets of that size and not have them full of buckles. It depends on the size of the holder what thickness of steel we would have on those holders; if it is a 5,000,000 foot holder, around the bottom it is about two inches thick.

The plaintiff has one five million foot holder under construction. The thickness of the steel at the top is generally about 12- 100ths of an inch, I think. In any scheme, the holder is built on the property. It does not make any difference whether it is reproduction new or whether the holder is reproduced new or the plant is reproduced new, the holder is built on the site. Whether it is built anywhere else than on the site, depends again this may be a question of definition. It is fabricated in the shop and erected on the site. The superintendent and foreman and a number of the riveting men are brought up from Baltimore. The common labor and some of the riveters and boiler makers, as they are known by trade, are selected locally, hired locally. All the unskilled labor is hired locally, and some of the skilled labor is hired locally.

In my preparation of this exhibit in determining these unit prices, I did proceed on the theory that the entire work of erecting the holder, for instance, would be done as if I had an actual order from the plaintiff for doing the work. [fol. 454] The price was just the same as we sold a holder

for at just about this time, for Wilmington, Dela. That is this two million cubic foot holder that we sold. We sold a two million cubic foot holder at Wilmington, Del., in the latter part of June or early in July, and I used the same price, and sold it on competitive bidding.

For the purposes of the Bartlett-Hayward business, in conection with the work of constructing gas plants, we buy all the material, every bit of the material that goes into it. We do not make any raw material. I buy steel and copper and brass. The price of steel used in this construction on June 1st, 1923; plates, structural steel, that is the basic price of plates and shapes, was a cent and a half per pound, Pittsburgh. This price I gave you with reference to steel, that was the price that prevailed on June 1st, 1923. The price that prevailed on June 1st, 1922 was 1.60 per pound. At the present time it is about 1.40 for plates and 1.50 for shapes.

I do not recollect at the moment just what the price of pig iron was in June. Since June 1st, 1922 the price of pig iron has gone up. I could not say to what extent. I do not know just how much it has gone up. It is somewhat higher than it was then. The price I quoted with reference to steel is the price in Pittsburgh to my company. I have to pay the freight from Pitsburgh; on New York purchases I will have to pay the freight to New York.

I am quite familiar with the periodical known as The Iron Age. Whether I consider that a reliable paper, depends [fol. 455] on what I want to get out of it. It is quite reliable when it quotes United States Steel Corporation prices. It is not reliable in its letters quoting the local prices, that is, with reference to the prices obtaining in ocal markets. It generally has a lot of lag on it, it gets onto the prices, generally, some weeks after they have changed.

In the first place, let me say I am not the estimator for the Bartlett-Hayward Company and I would use that periodical to refer to where it quotes products of the United States Steel Corporation. Where it quotes other products I do not take it very seriously because if there is a falling market I can skin the life out of it in purchasing, and if it is a rising market I can not begin to purchase at the prices they quote. I checked every price that was given

to me. If I checked the price on a pump I would not stop to figure the cast iron in it, or if I checked the price of an engine I do not know how much cast iron is in it, and if I checked the price of this table, for instance, I would not ask how much lumber was in it. I do not go that far down the line in checking prices. Of course, if I checked the price of a gas holder I do not check the price of the material that is in it. I do not keep myself very familiar with the market prices of Copper and Brass. I look at copper and zinc from time to time, but I do not use enough copper and zinc to keep up with it very much.

Directing attention to Plaintiff's Exhibit No. 39 and this [fol. 456] summary sheet, the page of which is not numbered, but it is the fourth sheet from the beginning, I have on that page certain items that the engineers calls overheads. I don't know what you would call exclusively overheads. Every item appearing on that page is necessary in order to build a complete plant. Certain items which are difficult to allot to specific underlying details, are all the items below tools and implements, which is about the middle of the page, except working capital.

These overheads are also called Undistributed Structural Costs. They ought to be in capital account whether they are distributed to the items of property or not, but in making an estimate of original cost or an estimate of reproduction, it is difficult to assign those specific items. Of course in a record of actual costs, some of these items will be found in the proper account and won't be found in this form. Omissions and contingencies, which is a record of a completed job, *don't* be found in any such form. That will be found in the items paid for, and very often it is possible to somewhat distribute the engineering and contractor's profit. Sometimes it is possible, and it is, as a matter of [fol. 457] accounting, done—distribute those to individual items.

Since 1908 the Uniform System of Accounts issued by the Public Service Commission of the State of New York requires a direct charging to capital account of numbers of these items I have set forth here and which I defined as overheads. I take it that all of them are charged to capital account, but they would be charged to capital account whether they be distributed to the individual unit or piece

of apparatus or whether they be shown separately. It would not change their being charged to capital account. The cost of acquiring franchises is included in the Uniform System of Accounts order. There is a provision for capitalizing that. I have included in this estimate, under the term "Overheads" the cost of acquiring franchises. Any amount that would be expended for that is included under my organization and development prior to construction. [fol. 458] That would cover the cost, if any.

Legal expenses in connection with construction are required by the Uniform System of Accounts to be charged to capital account. On my summary sheet I have Administrative, Legal, and Miscellaneous General, $209,306. The items are described at very considerable length at the bottom of page F and on page G.

The Uniform System of Accounts of the Public Service Commission surely have requirements involving miscellaneous general expense. You will find under Accounts 282 and G-286 that description of this account of the Public Service Commission; that is the system that was in vogue as of June 1st, 1923. That has since been changed, but I don't know of any particular change in that item.

I don't know whether or not the plaintiff would have to pay for the franchises that it acquired from the State. I have no specific amount charged here for the cost of obtaining franchises. I have an item of cost here that has embraced the cost of obtaining franchises. I haven't any specific amount for obtaining franchises, and I don't know that there would be any. There would necessarily be a cost in advertising and a cost for legal expenses, attending meetings—expenses of the officers, attending meetings, and arguing. There would be necessarily a very large expense, [fol. 459] but I have not provided for any specific amount.

In my organization and development prior to construction I have a figure set down here of $650,000. I say in connection with that, that this item covers the services and expenses necessary in the organization and the development of the company from the time of the inception of the project to the time when the charter, franchises, local consent, permits and so forth, have been procured, agreements obtained for the furnishing of the requisite capital and the projects brought to a point where construction can be com-

menced, and then I itemize it to some extent by saying it is for the services of sponsors, salaries of clerks, stenographers and other assistants, general expenses, such as rent and traveling expenses; preparation and circulation of prospectuses and preliminary advertising; the expenses for obtaining charters, including incorporation fee and the payment to the State on capital stock. For everything I have described under this heading in Exhibit No 39 it would cost at least $650,000. It would take at least two years to build this plant. I haven't made any specific allowance for any individual number of people anywhere in any of that account of organization and development. I have not itemized it anywhere. The work sheets show how it was computed, based on my experience. I have built a plant of the size of the plaintiff's plant at one time in my experience. The plant I built of the plaintiff's size was Unit D. at As- [fol. 460] toria of the Consolidated Gas Company plant at Baltimore. Unit D. at Astoria was built in 1920, and the Consolidated Gas Plant in Baltimore was built in 1902. The Ravenswood Gas Plant, the first unit was not the size of this plant, but the last unit, which was the size of this, was built in 1901.

The Consolidated plant was not in operation. Unit D was not in operation. The Ravenswood plant was attached to or became a part of an operating plant. Unit D at Astoria is an entirely independent plant, alongside of three other gas plants. I played no part in the organization of Unit D. In the organization of the Baltimore plant, I had entire charge of it. I laid out the plant and made all the arrangements connected therewith. I was the originator of the project for building that new plant. They had a franchise, but I employed everybody connected with it. I was vice-president and manager of the company, and I employed everybody connected with it.

In connection with omissions and contingencies, on pages C and D of my inventory, I have enumerated the items that go to make up that particular item if one were to build the plant to-day, and my estimate of the loss on small units of materials and supplies and for strikes or labor difficulties, and matters affecting the suitability or availability of materials, supplies, machinery and parts necessary in reproducing this property—that would cost $75,728. In a

project of this kind, assuming it was to be reproduced [fol. 461] today, that would be a part of the cost of the project.

Under no circumstances could I imagine a situation in which it would be a loss. This has been made up using the market price of every item of material and labor, and no such project or estimate could be made up, getting those prices for everything. You have got to have everything delivered at the time you need it. You have got to send men out on the road to expedite delivery of material, and you have got to pay premiums for various things. It may seem small in itself to pay the premiums, but the premiums are there; otherwise your whole crew is being held up. In all those items, you cannot segregate them out, you put the lowest cost on everything, but you just do not build plants that way, that is all. You do not get the lowest cost on everything. You don't find out everything until after that plant is built.

This is an estimate based on 35 years of experience, and we know that we have these contingencies. Our preliminary estimate used 10 per cent, not 5. This is an estimate after the plant is completed, based on a study of the costs of many, many millions of dollars of work after the work has been completed. I have never known of any occasion when they did not occur, and usually they do occur. I was looking over a statement just the other day which showed that there was 50 per cent on that, but that was rather unusual. I don't know that we have ever finished a job of this size without a strike. I don't know that we have, but if we had any kind of a strike on this job, I can assure [fol. 462] you that 5 per cent would not begin to cover it. I say any material strike. If you had any large amount of these contingencies mentioned, it would run into 50 per cent I was just talking about. It is assumed that this would be the absolute minimum of all these items. Everything there is the absolute minimum. In order to get within the 5 per cent, it would be necessary that it should be true—in order to keep within 5 per cent. I am absolutely recounting facts. I am recounting the experience of 35 years in this kind of work. Yes, this is a fact. This whole thing is a fact, except that it is all old.

This is the fact of what it would cost to produce the plant at the present time as a minimum. It is an absolute minimum that it would cost to reproduce this property; that is a fact. In my testimony a moment ago, I said I had been familiar with the plant for 20 years. Thirty years ago I was in Long Island City, which was not a part of New York at that time. That would take us back to 1894. That was the year I came to Long Island City. It would not be quite a full thirty years, because I did not come to Long Island City until June—I came to Long Island City in May. No, this plant was not built thirty years ago, was it? I came over here just after this plant was built. That would be about 1896, whenever it was. I went and visited the plant at that time, right after it was built. It was a comparatively small plant. I don't remember its capacity, it was a coal gas plant. I observed the development of that plant since that time. I think that is the date. I would not like to be too certain, but I think it was about [fol. 463] that time, 1896 and 1900, I was speaking of the manufacturing plant. The manufacturing plant was located at that time, where it is now at 55th Street and the river.

It was a coal gas plant. I don't know how many of those units it had. I have watched the development of the plant since 1896. I have been there from time to time, and it was built by the Bartlett-Hayward Company by the way, and many of the additions were made by the Bartlett-Hayward Company at subsequent times, but I have been there from time to time from the date of its building down to date. I don't remember exactly when the plaintiff or its predecessor began to install water gas sets. I don't know, around 12 or 14 years ago, I think, but I am not quite certain, about that. The capacity of the plant has been steadily growing.

I don't remember whether there were three or four holders. They had at least three, but I don't remember whether they had four or not. I don't recollect what capacity they had. I don't remember when this 2,000,000 foot holder was put in. This 2,000,000 foot holder is the only holder of plaintiffs that has more than a million cubic feet capacity, or as much as a million. That holder is not at the manufacturing plant, by the way.

It depends upon what you compare it with, to characteriz- [fol. 464] the development of this plant as a gradual development. If you compare it with Baltimore, it would be a rapid development, but if you compare to some of the other sections of Queens as they are growing, I should say that it was a gradual development. This section has been growing very fast, and the plant, comparing it to the Baltimore point of view, has been a very fast growth. It has been a steady growth with additions from time to time. That is, additions in buildings, additions in generating apparatus, additions in blowers, additions in boosters and all the equipment that goes to make up a gas plant. In other words the plant has been constructed piecemeal. Most gas plants are constructed piecemeal. I should say most are. None of them are ever brought into being fullfledged overnight, so far as I know.

It is quite physically impossible to bring a full fledged gas plant into being overnight. The development in the number of consumers is usually a very gradual one, extending over a long period of years, twenty years or more. There are many plants that have grown as this plant has. Some plants have been built complete. This is not exception to the plants that have grown steadily. It is an exception and different from plants that been built complete, like the D. Unit at Astoria, for instance or like the Baltimore plant to which I referred.

The Baltimore plant had a large number of consumers to serve when it was completed. The unit in Astoria was built to take care of the increasing business. If the business had not been greatly increasing, the unit would not [fol. 465] have been made. So you may say they did not have the consumers when it was built, but the consumers came along. It was immediately tied up with the entire system of the Consolidated Gas Company. It connected with it in a tunnel under the East River was used to distribute the gas that was manufactured throughout Manhatten and the Bronx. That tunnel particularly went into the Bronx, and after it was completed it immediately began to serve the public.

I do not know just exactly what plaintiff did pay for organization and development expenses prior to construction. If they did not pay them, I am sure it is the only company

that was ever organized that did not. I do not know what the amount was. I did not have any recourse to the books to find out what the actual amount was, if any. There is nothing in my appraisal that is taken from the books except what clearly indicates was taken from them. I do not know what, if any, amount was paid by the company for its franchises, or any permit that it has, nor for anything purchased previous to the period of this appraisal. I do not know what they paid for anything. That is, in these overheads, there is not a single actual item that I have included here, except taxes. Taxes are current payments.

I do not know anything about the predecessor, and I do not know what is paid in taxes. The taxes, as I stated, are current taxes. I only know that they did pay taxes on whatever amount of property they had as of June, 1923. I have just stated that I do not know of anything they paid previous to June, 1923, or thereabouts. That would apply [fol. 466] to all payments, of all kinds. Previous to 1904, work was done by the Bartlett-Hayward Company, my company. The buildings were constructed by a contractor. I do not know who constructed them at that time. I know they have been constructing it by contractors since that date, though. I do not know at that time whether or not any part of the services were installed by a contractor. I know what has been done since. I do not know whether any part of the meters was installed by a contractor. I doubt whether any of them were ever put in by a contractor and I have not put any contractor's profit on meters. So far as I know, the meters might have been installed by the employees of the company. I have not any doubt that they were, and I so figured them.

Directing attention to Plaintiff's Exhibit 40, I have prepared a summary of expenditures, as I characterize it, necessary to put the 65th Street works and the 65th Street Station of the Kings County Lighting Company in the condition in which they were when new. I mean by that descrip- [fol. 467] tion to convey the idea that, for instance on my summary page, preceding the sheet marked "Page 1," artesian well house, $26.02, if $26.02 were spent, the artesian well house would be in the condition in which it was when new.

I do not know when that machinery was originally installed described as, "Worthington Pump." With reference to the ash conveying machinery, the expenditure of $401.61 would bring the ash-conveying machinery in the same condition in which it was when new. I do not know when that was installed.

If you were to ask me separately about each item here appearing on this summary sheet and ask whether the amounts that I have indicated on the right side of the sheet as the sum necessary to spend to bring such apparatus into the condition which it was when new, my answer would be the same. If you were to ask me separately about each item of property here under the head of "Apparatus" as of the time when such apparatus was installed, I think my answer would be the same. I do not recollect at the moment that I know the time at which any one piece was put in. Generally, I do not know the time.

At the 65th Street Station I have indicated that there is a sum necessary to be spent in the boiler house of $83.52. The expenditure of such sum in the direction in which I have indicated here in my description would restore the equipment to the same condition in which it was when new. That applies to each and every item under the head of the 65th Street Station.

[fol. 468] I mean by "New gallery planking"—directing attention to page 2 of the part of my analysis under the head of "65th Street station," the planking on some of the galleries to walk around the holders. I just figured on putting new planking in.

"49 new shafts" means the shafts for the rollers were slightly worn. I estimated the cost of the improvements required for new gallery planking would be $20, I estimated the cost of making the change to the shafts, 49 new shafts and bushings, $5 apiece or $245. The rest is to clean and paint the holders. I do not know when they were last painted—comparatively recently.

As to the other holder of 500,000 cubic feet capacity, there is an item "Repair Outer Shell" on the same page. That item covers the holder which is just a little bit out of shape. In order to get it in the condition in which it was when new, I just figured on straightening the sides of the holder. When you straighten it, it would involve a few new sheets.

This is in the holder itself—the light sheets, and not in the lower tank which holds the water. You see, the tank is made up of very heavy plates. It has to hold water. The holder itself is made up of light sheets, only about 12/100ths of an inch thick, and it is that light sheeting that is somewhat out of shape. To the best of my recollection, it was frozen on one occasion and dropped and it bent it slightly. While it is in very good operating condition and does not need to be changed, but just in order to put it in a condition [fol. 469] as good as new or in which it was when new, it means straightening it out. I estimated the required cost of the straightening would be $1,895. That would be the sum that the Bartlett-Hayward Company would charge for doing that work on June 1st, 1923. 27 new shafts and bushings; the description applied to that previous item about new shafts would apply also to this. It is similar to the ones in the other holders. I estimated the cost of that improvement, $5 a shaft. That includes furnishing the shaft and putting a new bushing in the roller and putting them in place. There is an allowance of $85 for repairing a slight leak in one of the cups and the balance is cleaning and painting.

The part of a holder that rises and falls in the water, that is, the moving parts needs to be painted every two to three years. The guide frame and the tank and the other incidental metal work that are not moving would depend somewhat upon the climatic conditions. In this climate they usually go over the entire holder every two to three years, including guide frame, and sometimes they will paint the guide frame every second time that they paint the holder, that is, anywhere from four to six years; but it is best told by watching the structure. As soon as it begins to rust, it is a good idea to paint it.

At the 55th Street works, on page 19, I also have repairs to holders there amounting to $1,736. It is just $15 for calking and the balance is tank cleaning, painting. At the relief holder there is a repair to the guide rail there. That [fol. 470] amounts to $10, calking the leaks is $120 and the rest of it is for painting and cleaning. I have an item on this page, "Miscellaneous general inspection of running machinery, gauges, etc, "1,000." There was nothing evident as being the matter with any of the pieces of equipment that

are not specifically mentioned except that there were a few glasses broken on gauges, and I put that sum in as being sufficient to take down and inspect every piece of machinery that could by any chance have anything the matter with it, and to make the necessary repairs to it and to the gauges. It is an omnibus sum which was intended to make the estimate safe. Upon inspection, the item probably would be considerably reduced. It was made so large as to cover every possible contingency.

On page 17 of the same exhibit, Plaintiff's Exhibit No. 40 "salt water condenser," there are to be installed thirty new tubes. Of course anything that happens to them is from salt water, but there must have been something defective in those particular tubes, or some point where the iron was more or less vulnerable. Those particular tubes have given out. At the present time, by reason of such original condition, it requires the installation of thirty new tubes, to put the condenser in the condition in which it was when new. It is not required at the present time except under those conditions. If the thirty tubes had no particular weak spots in them it would be better than when new, because the new condenser had these thirty tubes in it which had apparently weak spots in them. These are about $10 a piece, slightly over that, $10.51.

[fol. 471] Directing attention to page 13, under the head of 55th Street Works, the water gas sets in generator house No. 2 have some minor work on them. That work is included in the notations made below, "Works No. 6." "Works No. 7." That is where I indicate the necessary work. They are two water gas sets works No. 4 and 5 and it is specified the work to be done on Works Nos. 4 and 5, and then farther along it says some work on Works No. 6 and Works No. 7. Those are the numbers by which the sets are known in the plant.

The Bartlett-Hayward Company did not install all these generators. I do not know, off-hand, when any of them was installed. Some of them have been installed since my previous appraisal, but I am not just sure of the date. That appraisal was made during 1917. Some of them have been installed since then, but I do not remember the exact date. It is my recollection that two of them have been installed since then. Practically everything here set forth with the

possible exception of that holder which, as I said, was dented in the side due to freezing, is an ordinary repair. That is a little unusual repair. I would not call repairing that dent an ordinary repair. The other things, so far as I see, are ordinary repairs.

On page 5 I have a stack, the last item on the page, steel stack. I have a notation there of "New Stack." It just means that that stack is somewhat burned and that the [fol. 472] stack itself cannot be put in a condition it was when new. It would require a new stack to have it in the condition in which it was when new.

Directing attention to page 47 of the same exhibit, the last item on the page, "hopper," in order to put it in the condition in which it was when new, it will require a new hopper. It is not necessary to do it at this time and it is not being done. That would cost $640. It is not furnished by our company. In the ordinary course of events, our company does not do much woodwork. That is woodwork with a metal lining. In the ordinary course of events we would sub-contract the erection of the woodwork and then furnish the metal lining. The sum of $640 represents the cost of a new hopper as of June 1st, 1923. Aggregating these entire sums I have enumerated here, I set down the figure on the preliminary page of $16,557.92 as the sum necessary to be spent in order to bring the 55th Street Works and the 55th Street Station in the condition in which they were when new.

In the construction of a gas plant, the storage holders are the particular part of the equipment that is the most expensive, generally speaking. The generators and accessory apparatus I should say are the next thing in line. I haven't thought about it just that way, but I should say that would be next in line, and by accessory apparatus I mean principally the blowers and meters, oil meters, piping [fol. 473] around the generator house. The boosters are not a very large percentage; nothing like the holders and generating apparatus.

Directing attention to page 33 of the Plaintiff's Exhibit No. 39, this hopper that I spoke of, I have listed here at $640, represents the cost of the hopper when new. That is, if we produce it new as of the 1st of June. This is an entirely new hopper in other words. In Exhibit 40 I show

that, in order to put the hopper in a condition as good as new would mean building a new hopper. The same amount was used in both exhibits.

The elevated track and equipment set forth in Exhibit No. 39, this coal and ash-handling equipment, the sum of $23,156, is the cost to build a new elevated track with the present equipment thereon at the present time. I remember I had repairs to that elevated track and equipment set down here in my exhibit No. 40. There are several small items here on pages, 5, 6, 7 and 8, the total aggregate cost of repairs to bring it to a condition just as good as new I estimated would be $3,340.55. Of course, when it had those repairs, it would be in as good condition as when new, and it would have the values that I have set down on this page 33 of Exhibit No. 39. I think it has the values now without the expenditures which would be made in the ordinary course. [fol. 474] In connection with my estimate of value one takes into consideration the fact that the plaintiff's plant is a growing concern and this is only an incidental part of the equipment of that growing concern. That must be taken in connection with everything that I have in it. All of these values are made as part of a complete plant, and none of them are complete in themselves.

All the items appearing on this page 33 are represented as the cost of this coal and ash-handling equipment new, that is if it were installed new on June 1st, 1923. Of course, in my estimate here on the repairs necessary to be done and the cost thereof, in order to bring the plant into as good condition as it was when new, there is no repair included to any part of the mains nor service system, no item of repairs necessary to meters. The prices for pipe and fittings come from a standard list that is used by all steel pipe people, and the current discounts as of June 1st. Those lists are promulgated by everybody that sells pipe. They all use a common list, everybody that sells pipe, steel pipe or wrought iron pipe—everybody uses the same list. [fol. 475] On pages 42, 43 and 44 it refers to the steel or screw piping. It refers to screw piping and incidents connected with it. Coming over to page 47—well, page 46, which is the summary, that carries some cast iron. Pages 47 and 48 refers to cast iron piping, bell and spigot cast iron. The cast iron piping; that is piping that I found

connected up in the plants. That is, in actual operation at the present time.

In order to get verification of my figures you could refer to the purchases at that time from the companies around New York or from the people who sell the pipe. There was quotations on that in the handbooks or in the journals. The point I make is that you could not get the information from them, because the situation was, as I stated a while ago, that there was a lag and it happened that just at June 1st, that is, late in May and early in June, there was a rise in price. The journals lagged four or five weeks before they fixed it up, so you could not check that price in any journal.

Manufacturers of cast iron pipe do not issue a price list. When I say cast iron pipe, I mean water pipe and gas pipe. They do issue a price on soil pipe, which is used by plumbers and which is also cast iron, but I never saw a price list [fol. 476] of standard cast iron gas pipe and water pipe. This estimate that I have here is an estimate of brass piping and steel piping and the cast iron piping. The covering and everything is all there, just as I saw it in operation in the plaintiff's plant. In connection with the Unit price that I have set down here you must distinguish between the actual cost of the pipe as it would be put down in the plaintiff's yard, for instance, and a differential which would include the cost of labor in installing the pipe and in covering it with the asbestos covering, that is, in order to reach the result I have here. There again the question is whether we are talking about cast iron pipe or ta-king about steel pipe. Cast iron pipe has no asbestos covering on it.

Covering is separately listed here, but that refers to steel pipe. I just want to get the record clear that the cast iron pipe is not covered. That covering refers back to the steel pipe.

The unit price of the ½ inch pipe is 3.69 cents. That is the bare cost; ¾ inch was 4.57 cents per foot. That was the price that prevailed on June 1st, 1923. The unit price of that bare pipe has not declined since that time. My recollection is that the same base discount applies. Now, you can get base discount from the Iron Age, this pipe being a product of the United States Steel Corporation. My recollection is that the same base discount is still maintained. The base discount on June 1st, was 62 per cent, and I think

[fol. 477] that that still prevails at the present time. That is my recollection of it. There is an extra five per cent for carload lots, and there is two per cent for cash, and I think there is an additional one per cent for certain large purposes, all of which have been taken off in this price. That is, I recognize those discounts in getting at the unit price of the pipe, as distinguished from the unit price of the pipe with the labor of installation included.

The 1-inch bare pipe is, as I stated 6.43 cents. Now, to that are added the fittings, which include valves, elbows, bends and hangers and all of the other material other than the bare pipe itself, including the pipe at 6.43 cents, which would be 20.9 cents. In other words, the fittings would be the difference between 6.43 cents and 20.9 cents.

The erection is 21.42 cents, making the cost of the pipe erected, on a bare labor and material basis 42.52 cents, to which is added the field overhead and the profit of the piping contracted, which is 8.89 cents, making the total cost of standard steel screw pipe erected in place, 51.21 cents per foot. I have used the same unit price in connection with the New York & Queens that I used in this case, for this particular item. The total I get would be gotten by dividing the length into that. I am giving the total price per foot. All of them are made up by taking the bare material and taking the labor. The covering on the next page is an additional expense where they are covered, that is the application of pipe covering. Some was not covered. Generally the high pressure steam pipes are all under cover. [fol. 478] Over on the next page, page 44, I have trenching. That applies to some of this pipe that is underground.

The ratio of pipe and fittings to the bare cost of the pipe is constant throughout. That is made up of the average at most of the plants. The erection price is not a ratio, that is based on a study of pipe fitter's work and of the amount of pipe that they put up in a day. They get sort of a union stroke and put up about so much pipe per day and, from observation, I have discovered about how much pipe they put up in a day, but the overhead and the profit is a fixed ratio. The piping contractors figure 10 per cent for field overhead and another 10 per cent for further profit, if you can get them down to that. Very often they go very much higher.

With reference to cast iron piping—of course those ratios

have no relation to cast iron at all. It is entirely different. There is very little brass piping, but I did use the same ratio. In the cast iron piping the fittings are taken off purposely. They were deducted, taken off and priced separately. If you will turn to page 46, you will see the summary of the other piping, as we call it. There you can notice that the fittings are priced separately by actually inventorying individual fittings. Of course, all this piping that I have estimated in this inventory is strictly within the plant itself, that is, it is part of the plant piping. It does not belong out in the distribution system at all.

I have in here quite a number of items like "gal". That is galvanized steel piping, galvanized and some extra [fol. 479] heavy. Those ratios that I mentioned a moment ago also obtain fairly constantly on galvanized steel piping, too. Those ratios, as far as fittings are concerned, were made from analyses of exact inventories of a number of plants, and they ran so uniform, and an exact inventory of all fittings for this small pipe is such a very extensive thing, that I used that ratio based on, as I say, exact inventories, also based on a large number of bills.

In the first place, all the piping is listed at 10 cents a pound. That is not exact, but it is approximate. It was exact when the list was first made up, but since then the weights have been slightly changed, and the lists have not; but at approximately it is all listed at 10 cents a pound. Now, the discount on ⅛ inch, for instance, is about 46 per cent, and then the discounts increase slightly until you get up to one inch and there the discount becomes 62.15. Understand, these prices that I am giving now are the lowest discounts and the freight is also mixed up in it, because it is figured delivered in Brooklyn.

Now, the 62.15 does not change from one inch to 3½ inch inclusive. The maximum discount is on one inch to 3½ inch inclusive, and you get the same discount on all of those. That is, the pipe costs you the same per pound for the one inch to 3 inch size. Then for 3½ inch the discount drops to 59.36, Brooklyn delivery, and that holds from 3½ to 6 inch. When you get to 7 inch and 8 inch, the discount drops to 56.57 and it keeps on dropping until you get up to 20 inch [fol. 480] and the discount then is only about 25 per cent, which means that 20 inch pipe would cost about 7½ cents

a pound delivered in Brooklyn, whereas one up to 3 inch inclusive would only cost you about 3.8 cents a pound.

Cast iron pipe is quite different. Generally there is one price for 6 inch and over. As of the 1st of June, however, of last year, there was a very large demand for 6 inch and the foundries were charging two dollar a ton extra for 6 inch pipe as of that date. Generally the 4 inch pipe costs $5 a ton more than the 6 inch, and the 3 inch pipe $10 a ton more than the 4 inch; making a differential of $15 a ton between 6 inch and over and 3.

On page 46 you see there is over $70,000 cast iron pipe and fittings. The price on 8 inch and over is $67.50 per ton; the 6 inch is $69.60, the 4 inch is $71.60, and the 3 inch is $76.60. There is only $8 differential between the 4 and 3 in that case. I estimated that on the unit basis of one ton, of 2,000 lbs. I have some figures here which would disclose that I have added to it to represent the cost at installation.

There is no contractor's profit on that. I assume that, acting as a general contractor, I would put it in myself, and the only contractor's profit would be the general contractor's profit as shown on the summary sheet. Let us take, for instance, 8 inch pipe. That would be 1.4666, to which would be added an inspection .0054. This is expressed in [fol. 481] dollars. In other words it is about half a cent, .0054 equals 54-100ths, a little over half a cent. Then the jointing material in that is $.1550. That is a little over 15 cents. The blocking and wedges are $.03, and the trench bracing is $.1320. That gives the total material as $1.7690 per foot. The labor is $1.2451 per linear foot.

I have on pages, 46, 47 and 48 enumerated the quantities used by the plaintiff of cast iron piping in its plants at 55th Street and First Avenue. Those are the pages that include the cast iron piping. There are some very large sizes of steel piping on page 49. They are special riveted steel. That is not the standard steel—screw steel, such as I referred to in my other remarks; this is riveted flange steel pipe, and it is made up of two items. The main portion is the pipe itself, which cost 8.8 cents a pound in place, to which are added the flanges, which set in place are $37 a pair. In other words it is made up of two independent items, and it is made up by using average lengths. That

applies to the riveted steel piping, as I have indicated it on page 49 of Plaintiff's Exhibit 39, that is 20 inch. The 24, 20 and 12 inch would be different prices, the 24 instead of being 8.8 cents a pound, is 9.2 cents a pound, the 20 is 8.5 cents a pound, without the flanges in each case and the 12 inch .07 cents a pound without flanges. The unit prices of installing these various sizes other than 30 inch vary. These prices I gave are the installed prices. You see, this type of pipe is made by the Bartlett-Bayward Company and this price includes the manufactured shipping to the Kings County plants and the installation. There has been some [fol. 482] decline in the prices on cast iron pipe since June 1st, 1923, for deliveries in the early part of 1924, that is winter deliveries. I understand that for deliveries after March the price is about the same, but I am not quite sure of that, but I know that contracts made in December for winter deliveries were shaded two or three dollars a ton from the June prices. Ordinarily, cast iron piping during the winter time can be purchased cheaper than in the summer, if you will accept delivery during that period. That is not true of steel piping.

These unit prices that I have used for the piping in the work of installation at the 55th Street Works, I also used the same prices for the piping in corresponding kinds and sizes at the 66th Street Works of the Plaintiff. I did not make any variation due to the difference in location. It would be such a minor figure that it would not count, and I have used one price for the whole Metropolitan District. That is, for all the other gas companies on which I am now making inventories and making up unit prices, I have used these same prices in each and every case. This Exhibit 39 I have here and can give you all the elements taken into consideration in arriving at the totals set down for all the classes and sizes of wrought iron pipe shown on this exhibit. I had the cost of cast iron pipe, the details of all the cast iron pipe. I do not know that I have all of the analyses of the riveting piping, which is a manufactured product of our own plant, steel riveted. I could give the same ele- [fol. 483] ments as to all the items I have given as to specific items about which I have been interrogated in the different classes.

On page 61 I have set an estimate down for the meters on the district, i. e.:

A 3-light meter, including caps and swivels, in the storeroom, is	$8 27
A 5-light meter is	9 01
A 10-light meter is	12.03
A 20-light meter is	22 47
A 30-light meter is	33.01
A 45-light meter is	50 99
A 60-light meter is	65 69

The 100-light meter is $112.29, the 150-light is $174.51. The 200-light meter is $240.66 and the 300-light meter is $349.13.

That was the price of the meters including the caps and swivels and including the handling into the storeroom at 65th Street and Ninth Avenue, as of June 1st, 1923.

Of course in my estimate here I have added the sum of $264,855.50 for the work of installation. The unit price for installation would be larger with the large meters and smaller with the small meters. It is not very far, on the average, from the 5-light meter, which is very much in the majority, and which is the base price that I have used as an average of the whole. As I say, I took really the installation price of a 5-light meter and applied it to the whole as an average. That was $6.50. That included sending a man [fol. 484] from the plaintiff's plant out to the consumers' premises, setting up the meter, building a platform and connecting the meter pipe with the riser, as well as the pipe coming from the service. Of course you do not send a man out for each meter, but it included the labor of all of the connecting from the service pipe to the meter inlet and from the meter outlet up to the riser and supporting the meter. I used the average of the 5-light meter for all the meters.

The installation applies only to the meters that were in service as of May 1st, 1921. The first page is mere summary; what you call page 61 is really a summary sheet. It should have been paged, but really was not. It is a mere summary of the three succeeding pages. Page 61 in this exhibit refers to large piping.

This figure on this summary sheet is indicated on a summary sheet here at the beginning of the exhibit, opposite the notation meters, $816,870. The figures vary slightly here; one is eight hundred and seventy and one is eight hundred and sixty nine and odd cents three cents difference. I used the even dollars on the first summary sheet. I brought everything up in even dollars.

On page 65 I have not itemized the property in the laboratory nor the property in the office nor the property in the stable, nor the property in the storeroom; these are just the book accounts I have taken those from the books. These figures that I have set opposite are taken from the books. These figures appear on the ledgers of the company.

[fol. 485] In speaking of the mains system I spoke of cases that might require the withdrawal of mains, and I failed to mention the one that I thought was very important, and that was electrolysis.

Electrolysis is commonly known as the destruction of metal by the flow of electric current in a conducting medium, from the metal to the conducting medium, which is more or less likely due to the leakage of electricity from imperfect conductors or due to the deliberate turning loose of electricity through the electrode into the bath, as is the case in an electric battery or electric plating process. If you hang up a piece of zinc in an electric bath and connect the other end of the wire to a piece of copper, for instance, [fol. 486] and suspend it in the bath, the electrode is destroyed, the zinc electrode is destroyed by electrolysis and deposited on the other metal. That is electrolytic action. It is deliberate. The metal itself is actually decomposed and placed on to the other unit; it disintegrates the metal.

To my knowledge that is not a very common cause in the deterioration of mains. I never knew of but one piece of main in all my experience destroyed that way. I know one piece of main once which paralleled a trolley track for a half a mile in a very wet soil, and every bond on the trolley track was broken and it destroyed that piece of main, and that is the only piece of main I know of being destroyed by electrolysis. I have seen two or three holes burned in them. If that result accrued, however, it would be absolutely necessary, if it were on the plaintiff's lines, for the plaintiff to

renew that particular piece of piping. That piece of pipe [fol. 487] was destroyed, practically, and it was replaced.

Considering my testimony given before Judge Greenbaum in the former case involving the Kings County Lighting Company, I do not reccol-ect as to what I did put in as the overhead at that time. I don't remember. I cannot assume that that was a standard I used then. I don't know. I don't remember what I gave. It is not a standard. It is what it would cost then, as I now give what it costs now. This is no standard that I set up now except the cost as of the 1st of June.

In connection with that working capital, I did not take an estimate of working capital at all. It is the average capital being used by the company during 1923. In the New York & Queens case, that was practically the same thing as the working capital being used by that company. The Master found it so. I didn't check it up. I will leave it to the company and the Master.

The cost of Gas Meters has not declined since June 1st, 1923. The price of meters that is currently being paid by the various companies in the Metropolitan District, purchased from the American Meter Company, for instance are net prices. The list price is very considerably above the prices which I have used. The discount is somewhere between thirty and forty per cent., from the list. I forget the amount, because I very seldom use it. At any rate, I have used that discount in this estimate. These are net prices.

Referring to that part of Exhibit 39 which contains the [fol. 488] inventory and appraisal made by me in my opinion it would cost to produce the exact plant of the plaintiff as at prices of June 1st, 1923, on a labor, a material and subcontracts basis, the price that I have given. I estimated on an efficient plant, competent and designed to do the work which this plant is called upon to do, and that plant is a duplicate of the existing plant. The exhibit shows that I used book figures for general equipment, tools and implements, office, shop, store and stable equipment, and so forth. I investigated to see if all of these items were used. I did not make any count or check of the items that show on the company's books. There were so many small items it was not worth while.

I have just testified in this case that I have been employed by all the New York City gas companies in the present gas litigation. That I knew when I prepared this exhibit that no gas plant of the kind was to be constructed by the Kings County Lighting Company; it is self evident. This exhibit is based on competitive bid figures. It is not a bid at all.

I am an officer and stock-holder in the Bartlett-Hayward Company. This company secures considerable business from the New York City Gas Companies. As an entire group they probably are the largest customers of my company. I would not like to say that unqualifiedly, but we do a great deal of business with them, if that is what you are trying to develop—a very large amount of business.

[fol. 489] In this exhibit I estimated the value of certain meters that were in the storeroom of the company on June 1st, 1923. I am not quite sure that any of the gas companies in New York City at the present time purchase what is designated as "Three-light meters." In my opinion as a gas expert, the purchase and installation of three-light meters in such a territory as that in which the Kings County Lighting Company operates is good gas practise. That is the type of meter that is being installed for companies in New York City where the load is small enough to require nothing larger than a three-light. It depends upon the size of the burner, how many burners a three-light meter will supply.

A three-light meter will supply eight or ten ordinary Welsbach burners. It depends upon the stove whether such a meter will supply a gas stove of the ordinary size. An ordinary gas stove with four lights on top and an ovem, whether it will satisfactorily supply such a stove depends upon how hard the stove is going to be worked. It would not supply entirely satisfact-ily all the burners going at the same time, unless there was pretty good pressure in the street. If there was enough pressure, if it was not less than 2 inches of pressure at the meter, an ordinary stove with four burners and an oven burner would be supplied very satisfactorily with a three-light meter. If the pressure fell below 2 inches, it probably would not. If I knew that such a stove was in a consumer's premises, I would not reccom-end the installation of a three-light meter. I do

[fol. 490] not think I would. I do not think they are set under those conditions generally. There are 1,319, in the storeroom.

One of the preliminary sheets on my exhibit has been marked "General summary sheet." There is an item for omissions and contingencies. That figure is below my actual judgment of what it would be, and based on my experience. It is a judgment figure, based on many years of experience. I also have a figure for organization and development prior to construction. That is a judgment figure also based on experience. I don't know what this company's actual experience was, but I have no doubt that it actually cost this company more.

The cost of financing is the current cost of financing of going concerns, principally by bonds, and it is a low figure for cost of financing a construction proposition, as this would be if it is reproduced new based on stock and bonds.

I also have an item "Interest During Construction." That is a judgment figure in constructing its plant, as judgment is defined here. I also have an item, "Administrative, Legal and General Expenses During Construction." That is a judgment figure as defined here. I also have an item for Working Capital, that is not a judgment figure, but based on the actual experience of the company.

I have also offered an exhibit No. 40 which has been received in this case. That exhibit contains an amount to cover unobserved or accrued depreciation; all that there is. [fol. 491] I say it includes all the depreciation there is; although I would not call that depreciation. There is an item in here for all the accrued depreciation that there is. I say there is no such thing that in that estimate was unaccounted for. When I answered that I included all there was; I meant there isn't any depreciation on the property unless you so interpret what it would cost to put the property in the condition it was in when new. In making this exhibit I did not investigate to discover the age of the different items of property appraised and inventoried in Exhibit 39. In Exhibit No. 40 I did not include any amount for obsolescence or inadequacy. I included an amount to cover wear and tear caused by use where there was any. I included something for it.

In Exhibit No. 39 I have given the value as now to each of the items irrespective of what its age or use has been. In this exhibit I have used the term "Value," and the term "Reproduction Cost," as equivalent terms. I did not make any investigation or inquiries from the officers of the company to determine if they planned to remove any of the items of plant set forth in Exhibit No. 39. If the company did so plan I would not deduct the value of those units at this time. There were certain units which were not used, which I did not include. I do believe the unit of plant should be given its full reproduction value the minute before it is retired, if it is properly maintained and in the condition in which it was when new. The value of the item after it had been removed would not have any effect on my valuation.

Inventory and appraisal of the automobiles owned by the [fol. 492] plaintiff company are included in their equipment accounts. There are included in General equipment, including office, shop stores, stable and so forth, as shown by the books of the company. That is on the summary sheet. I believe there is a page setting forth the detailed of stable and garage equipment. I have not here my working papers to show what that stable and garage equipment is made up of, this is all the information I have. This is the balance on the books, as stated on that page.

I did not examine the automobiles to see their condition. This amount for stable and garage equipment is the value in which it is carried on the books. That is the purchase price. There is no deduction for any wear and tear to those automobiles. I did not investigate to find when they were purchased. There is something I did. I investigated, as I have already stated, to see how these capital accounts compare to the business done, how the amount in the accounts compares with the amount of business done. I investigated to find what the present condition of the automobiles or other stable equipment that I inventoried here was at that time to the extent of making inquiries as to whether they were functioning satisfactorily, that is all, and if they were being regularly replaced, as they were.

On page 16 of my summary pages I have inventoried a Williamson water gas set, 12 feet, and appraised it at $73,086.85. I don't recollect when the company purchased that

water gas set, although my company built it. I could not give you approximately when it was purchased. I would [fol. 493] not like to specify its age. If anybody wants it, our company manufactures and sells that particular type of water gas set at the present time. Our company does not recommend the use of any particular type of set. We deal with people who know what they want. The last time my company sold a set of that type, I think was three or four years ago, if I remember rightly. I am not sure of the exact date, but I think within three or four years.

There is no statement here that a 12 foot Williamson set cost $73,000. There are two sets costing $73,000, right on the face of it. Therefore, that is misleading as to whether I would recommend one set at $36,500, odd or two sets at $73,000 odd is a question entirely of the conditions existing in the plant, and I might very easily do it, but that would have to depend upon the conditions as of the plant. I think the installation of a set of that kind at the present time, to supply a territory similar to that of the plaintiff's would be good gas practice.

There is a profit on everything bought from material salesmen; absolutely, there is profit on the cast iron pipe to the pipe makers; there is profit on the steel pipe to the pipe makers; there is profit to everybody. I think you understand what I mean. If your engineers attempted to check that up, there is nothing in my exhibit to show that profits has been used. I have possibly added a great many contractor's profit to the bare cast of labor and material in the other items. I could not off-hand say what the profits are to the sub-contractors in any of this work. I could [fol. 494] not offhand tell you that. I figured here that the Bartlett-Hayward Company was a general contractor and they let certain of the works to sub-contractors. They would let all the foundations, all the small piping. They would let all buildings, mains, services. I figured that as a general contractor we would let it all and the other witnesses would be sub-contractors to the Bartlett-Hayward Company. Then of course the equipment would be definitely ordered from—for instance, exhausters and engines and various other types of equipment, would be ordered but installed by the general contractor. That is, installed by my company. I did not figure on overhead and profit on

that except the figure I have included in my summary sheet. Not for installation. There is of course overhead and profit on foundations; that is for the sub-Contractor, and on the distribution system. But on foundations I added 10% to the bare cost of labor and material for the sub-contractor's profit. On small pipe, I testified I allowed 10 per cent, for profit on the piping. That does not include both profit and overhead.

I added for overhead 10 per cent. and 10 per cent. profit. On the foundations I did not add the same percentage. I added 5.58 for overhead and 10 per cent. for profit. Other items I estimated would be constructed by a sub-contractor: artesian well. As to that I took the current price of artesian wells drilled. I did not estimate the amount of labor and material to construct that. I simply took the current cost of artesian wells. Artesian wells have a regular market figure, in that class of soil. If any profit in or [fol. 495] overhead was included in that figure, I did not estimate them separately. The next item is a steel duct for handling the forced draft to the boilers, a steel tank—I arrived at those figures on a pound basis. I mean by pound basis, the cost per pound for that kind of material, to erect it and then I added a figure for labor, the cost per pound erected includes labor and material, and all the costs and profit for that. It includes the profit for the contractor. There is 10 per cent. on that, or overheads, sub-contractor's profit included in that forced draft.

Practically everything except the piping; that is, the piping and the general assembly of the plant would be done by sub-contractors. The detailed units of installation and individual units could all be done by sub-contractors. The Bartlett-Hayward Company would act as a general contractor. I did not estimate that the Bartlett-Hayward Company would install the generators and boilers themselves or if they did install the generators, they would install them as a sub-contractor. On all the items there is a sub-contractor's profit, in addition to this percentage. As far as I know there is, except in the case of the large piping, and there it ought to be on that. To the best of my recollection that is the only item that I do not include.

Of course, in the case of installation of equipment, such as exhausters, engines, pumps and so forth, they are not

figured on being installed by the sub-contractor. They are figured on being installed by the general contractor. But the pump and engine and so forth would carry a manufacturer's profit, but, no installation profit. The holders are figured on being installed by the Bartlet-Hayward Com-
[fol. 496] pany as a sub-contractor. I estimated the shop overhead is about one-sixth; the field overhead—that is on of the work done in the shop is about one-sixth, that is the actual cost to the Bartlett-Hayward Company. The field overhead costs 7½ per cent., and I included the costs for field overhead and then 10 per cent. for profit.

The sheet of paper handed to me by Mr. Hyatt is the cost of installing standard steel pipe, including fittings, valves and so forth in the gas plant. That is steel screwed pipe, and also shows the current rate or the rate June 1st of fitters, helpers, and allowance for foreman and insurance, showing what a gang costs in a day. This runs from ⅛ inch up to 20 inch, inclusive. That is, it is an analysis of the cost as set down in this exhibit.

I used some of the figures appearing on that sheet, that I have just described in preparing my exhibit known as Plaintiff's Exhibit No. 39 in this case. It is used in part on page 42 and in part on page 54. The largest steel screwed pipe that this company has is 10 inch, and this exhibit runs up to 20, so that there is nothing used—I mean this sheet you are referring to runs up to 20, so there is nothing used above 10 inch.

On pages 42 and 54 of my exhibit I will indicate what sizes on those pages reflect the figures on this sheet, i e:

The ¼ inch, ⅜ inch, ½ inch, ¾ inch, 1 inch, 1¼ inch, 1½ inch, 2 inch, 2½ inch, 3 inch, 4 inch, 5 inch, 6 inch, 8 inch and 10 inch. It was four or five and possibly six months ago [fol. 497] that I compiled the figures on those sheets representing the costs as indicated by me. They were compiled before I made up the Flushing appraisal. I don't remember just when that was. They were used first in the New York and Queens case. I have used the same units where the material was the same specifications. There are not other sizes except those that I gave indicated on pages 42 and 55 of this exhibit, no other sizes of steel pipe.

In my unit cost of cast iron pipe as indicated on one of the pages of this exhibit I compiled a unit price as to that,

including labor and work of installation. I have that with me. On my exhibit marked No. 39, Plaintiff's Exhibit in this case, where there is cast iron pipe they reflect the unit prices compiled by me. I have with me this morning those compilations that I have indicated as to the prices of cast iron pipe and the unit cost of installation.

Page 5 and page 19 of a book entitled "Kings County Lighting Company, Pipe and Fitting, Unit Costs, June 1st, 1923." (Marked Defendant Attorney-General's Exhibits 1 and 2 respectively, for identification.)

The Plaintiff's Exhibit No. 40 which I prepared, these figures that I have set forth here are the new brass cover on the bearing of a motor. That is a replacement in one sense, and yet it would not be changed to replacement in the accounts. Four new liners in a pump, that replaced the old liners, but in an accounting system it would be charged to repairs.

[fol. 498] In connection with the figures in Plaintiff's Exhibit No. 40, they would properly be characterized, in my estimation, as current repairs in most cases. Another synonym of those words "current repairs" would be "maintenance."

I do not know of any items in this exhibit which I have compiled here known as Plaintiff's Exhibit No. 40, any one of them, that within the next month may be withdrawn from service. If as a matter of fact, I was told that certain items were to be withdrawn from service within the next two weeks, that would not in anyway affect the exhibit known as Plaintiff's Exhibit No. 40. At the time I compiled this exhibit I was not told by any representative of the plaintiff company, that there was any part of the property enumerated in Plaintiff's Exhibit No. 40 that was to be withdrawn from service. If they had so told me, it would have had no effect on this exhibit.

I have a moderately definite recollection of this 12-foot Williamson generator set in my mind the present time.

[fol. 499] Those sets are made up of a steel cylinder, which is 12 feet in diameter and 22 feet high. At that point it spreads to a diameter of 14 feet and 24 feet high, making it 46 feet high over all, and two diameters. The bottom part has a grate in it and it is lined with fire brick. The upper part is also lined with fire brick and it also has in it loose fire brick, that is, the space is filled to the extent of

about 50 per cent. or more wth loose fire brick, through which the gas passes, this fire brick being heated up and being used to fix the gas. There is about eight or nine feet depth of coal on these grates. It has the usual cleaning doors to get at and clean the fire and to charge coal, and also cleaning doors in the upper part to handle the fire brick in and out, and the blast steam and steam and air connections, and then the gas connection and the outlet which comes from the top.

That description I just gave is the set you asked about—The Williamson set. I do not think there are any other 12-foot sets in the plaintiff's plant. The sizes of the remaining water gas sets in the plaintiff's plant are some 8½ feet and some 11 feet. They all function the same way. The method of producing gas is not in any of them, any different from this 12 foot Williamson set. The method of putting coal in is slightly different. In one case you put it in by a door on the side of the machine; in the other case you put it in on top. Structurally the carburetor in the Lowe water-gas sets, as it is commonly called, is a separate cylinder, in-[fol. 500] stead of all being built in one shell as the Williamson is. The Williamson is the more recent machine, water gas set.

Mr. Williamson was the engineer, afterwards the vice-president of the Peoples Gas Light & Coke Company of Chicago. He is the patentee of this particular machine known as the Williamson Generator Set. The Lowe sets are very much older than the Williamson Set. That patent expired in 1902. Seventeen years back would make it 1885, I guess. It expired in 1902, I remember very well.

The Bartlett-Hayward Company makes Lowe Water gas sets now. They also make Williamson water gas sets. Within the last five years they have been increased in the size of the connections and been adapted to automatic operation. That is about all. I do not think this 12-foot water gas set of the Plaintiff, known as the Williamson set has the large connections, it does not have those improvements.

The same improvements have been made in the Lowe Water Gas Set during the last five years as the Williamson. The plaintiff's 11-foot Lowe water gas sets have these improvements that I have just described.

[fol. 501] The plant of the Plaintiff is an efficient plant and is sufficient for the service that is on it, except in its

storage capacity. It has not sufficient storage capacity. That is the work that my company is now engaged in doing—increasing the storage capacity.

In reference to Exhibit 39, the items on the general summary sheet below the item "Tools and Implements" and not including the item "Working Capital" were judgment figures, they were not mere guesses. They were based upon the current cost of such work. This is my business and I am doing such work continually, except in the matter of organization and financing, and that is based on my observation, of course, and my experience in past years, and not currently.

I did not allow in Exhibit 40 for obsolescence and inadequacy. I did not observe any obsolescence and inadequacy in any of the items listed in my Exhibit No. 39. I examined all the articles embraced in my appraisal of the stable equipment. I stated that I had taken that from the books of the company. I further stated that "we compared our book entry, our book balance, with the experiences of other companies and found it comports with the experience of other companies." There is no exact uniformity to the experience of other companies in reference to the amount of this item and the amount of business done, but some of them are higher than others, depending on locations and classes of territories in which they operate, and so forth. This company in considering its territory is very reason-[fol. 502.] able. The amount which I found in the books of the company, in the balance of that account, was not the largest proportion to the business done of any company I have examined. I don't know whether it was the smallest or not, I do not remember. These improvements which I mentioned, made to the Williamson and Lowe generators, had been installed on the machines of this company, and I stated that they had; at least, as to automatic operation upon the 11-foot sets, and they have also on the 8 foot 6 sets; I overlooked that.

(Defendant Attorney General's Exhibit No. 1 for identification received in evidence and marked Plaintiff's Exhibit No. 68.)

(Defendant Attorney-General's Exhibit No. 2 for identification received in evidence and marked Plaintiff's Exhibit No. 69.)

Obsolescence is the state which is reached by a piece of apparatus or equipment when, through development or change in the art, it becomes no longer economical to operate that equipment. Inadequacy is the state of the piece of apparatus or equipment when the load or work has so increased that it will not handle the work without assistance. It may be made adequate with assistance.

[fol. 503] The sum of the individual units may be inadequate to make all the gas that is required; then you must put in new ones. That is not any reflection upon the individual units. It just means that it is overloaded, that is all, and that it needs assistance, as I expressed it. That would apply to any piece of equipment in the plant, but let me explain that, I think I can clear it up. It sometimes happens that a piece of equipment becomes inadequate and it is cheaper to take that equipment out and replace it by a larger piece of equipment in the same building than it would be to put up an additional building and put another unit alongside, and it is in such cases as that, that equipment is abandoned on account of inadequacy, but in no case of inadequacy would it be imposible, as far as I know, to add additional equipment and keep the old equipment operating. It frequently happens, however, that it is more economical, as in the Flushing case, if you will remember where it was cheaper to take out a boiler which was inadequate and replace it by two new boilers, than it was to put up a building and put an additional boiler in the new building. It was cheaper to do it that way, to abandon the old boiler, although that boiler was in every respect as good as new.

Very often the capacity of a generator can be very greatly increased by slightly increasing the diameter. In other words, an increased capacity gas generator can be put in the same room as the lesser capacity, providing the room was originally designed quite liberally. Sometimes it is [fol. 504] done in that particular equipment. There is nothing that is inadequate, to the extent of taking it out and putting in new equipment in your situation down there. Those 8 foot 6 generators are not overly large for a plant of that size. The other generators are very average generators, for plants of that size. Those are average gen-

erators for a reserve plant, 8 foot 6 generators are wholly adequate and entirely satisfactory.

Take the boiler capacity, that is made up of several boilers, I think there are six or more, if I recollect rightly. I have forgotten the exact number. If you did not have an adequate boiler capacity, that would not be any reflection necessarily upon any one boiler. You needed additional boiler capacity and you put in additional boilers two or three years ago. When your load grew to such a point that you needed additional boilers, you put new ones in, and if you needed additional generating apparatus, if your generating apparatus was inadequate, you put in additional apparatus. I don't know of anything in the works in a condition of inadequacy.

I stated that the holder capacity was inadequate for your plant as a whole and that you needed additional capacity. No individual holder is inadequate to your capacity as a whole. When you put in additional plant because existing plant is inadequate, that always goes to new capital, unless in a case like the New York and Queens where it was cheaper to abandon. That, in part only, was a case where I put in [fol. 505] new boilers. The company charged off the value of the old unit and added the value of the new units, which greatly exceeded the old unit.

I don't know that an 8 foot 6 generator would facilitate the handling of such a load better than if it was a larger generator. Those machines are automatically operated and use very little labor. All you have to do is turn a switch and shut them down. It is elastic enough; the small ones or the large ones either, are very elastic in operation. There is no difference in the efficiency of these generators. The 8 foot 6 unit is just as efficient as the 11 foot or the 12 foot generator. The largest size they make is 12 feet.

They made a 13 foot machine some years ago; oh, I guess it was over 20 years ago. The Consolidated Gas Company put in some 13's, but the diameter was so great that it was difficult to get at the fires to clean them. They replaced those generators with 12 foot generators, but that is really about the only limiting condition, that is, the facility of getting at the fire. Where they make straight oil gas, they run up to 25 of 30 feet, I think. Take your plant; I have

given a figure here of repairs, one thing or another that might be done to bring the plant up to a condition good as new. Some of it has been in operation for a considerable length of time. It is possible to get a gas plant up to 100 per cent efficiency; that is, the efficiency of a new plant. It is done just by maintenance. By maintenance I mean repairs.

[fol. 506] Different items in the plant are so constructed that wearing parts are removable without throwing away the whole unit. That is the design of the plant. That is the merit in the type. That applies to boilers and generators, blowers and one thing or another. Not only movable, but all the machinery. Fire brick in the furnaces, in the gas-making machines, and sometimes even a casting on the shells will go and we will replace those if we can. If they drop hot ashes or cinders on the bottom of the generators, we put new sheets and do put new sheets in the bottom of the generators. So there isn't any part that cannot be replaced if it becomes necessary. Ordinary repairs will do that. I never have in my experience seen any major unit of apparatus abandoned, except that through a change or development in the art, or through its particular location, which is wanted for some other purpose, it made it more economical to abandon it than to keep it in operation.

In running a plant practically everything is kept in condition by the repairs from year to year. Sometimes through neglect or for other reasons some minor unit may be replaced completely. After all, it is a question of accounting how big an item must be if you call it a replacement, or to call it a repair. When you put a new bearing in an engine, that is a complete new part, yet you could call it a repair. If you put in a whole new engine, you would probably call it a replacement, even though the engine were a very small part of some other group of machinery. Or a new engine in your coal-handling apparatus, you might [fol. 507] call that a repair to your coal-handling apparatus. In other words, if this shell around one of the generator doors broke, I would call that a repair. That is putting in a new door frame. I would call that a repair, I would not call that a renewal. It is just a question how the engineer on the job would classify it. I should classify a new door

frame as a repair to the generator. Now, the engineer on the job or the auditor might call it a replacement.

Now let us assume that you needed more than your two and a half million storage capacity in the holders and you did not have land and could not get land, but had to get more holder capacity on that land; that is, you have got just land enough to hold a 2,000,000 and a 500,000, and you want more holder capacity and you cannot get more land. You would have to take down the holder and put up a bigger one there. I did that in 110th Street, New York. That would consist of a replacement to the extent of the value of the old holder and capital account beyond it. That sometimes has to be done for lack of land. It is advisable at times. It becomes economical to do it. That is a renewal or replacement to the extent of the value of the article that is taken out. I would add to my fixed capital the difference between the two.

I know your holder site up there. I am building a new holder on it. If I did not have that land there and could not get land, I think I would have to do the thing that I suggested. I would like to give a little more study to that [fol. 508] than to say it offhand, but I think very probably that is what we would do. We did that in New York between 110th and 111th Street on First Avenue back in 1901. That replacement would come around through inadequacy. It is one of these cases where the holders are inadequate and you have got to have more holders, but, it is more economical to wreck the holder than to erect a new one at some other site. This morning, I said that the holders were inadequate. I have not taken off anything for that feature of it. You will need more holder capacity. I did not mean that there was any deficiency in any holder that you have, but, there is not enough holder capacity.

I do not know anything about your facilities at your office building which you rent, whether they are large enough or not, only just what I happened to see there, but I have never made any study of it. If you owned that building and it was not big enough for your commercial force, you would have an element of inadequacy there, in office space. You would have to get more space. It would not hurt the value of the building necessarily. In this case an investment in a utility of this kind can be perpetuated by repairs and re-

newals and replacements. Repairs, renewals and replacements, of course, are charged to operating expenses.

By doing this I can absolutely keep a utility of this character operating at 100 per cent, efficiency and without lessened value. The rate has to provide for that. So far as I go into the rate end of this case, I would absolutely [fol. 509] say so. I have had to look after the financial end of the corporations manufacturing gas, and I have tried to do that, perpetuate our plant out of the rate. It is not intended to have an impairment of capital from year to year because the plant has been in operation. You take the 21st street plant of the Consolidated Gas Company, which was built in 1860 originally. It is better today than it ever was in its history. I would say that your plant started along in 1900 is better than it ever was.

In the New York & Queens case, Mr. Little came in and examined all the underlying data that he thought proper, and I should be very glad to have my records right here, nearby, wide open, and give all the underlying data to any engineer. I would be very glad to meet him on the coming Thursday. Make it 10 o'clock Thursday at the office of the Brooklyn Union Gas Company, fourth floor. Though this appointment is made for Mr. Little, I would be very glad to include an engineer from the Public Service Commission. It is understood that Mr. Merrifield or anyone else may join in examining this underlying data and if that particular time should not be convenient for Mr. Merrifield, or whomever he would want, why I would make any other date. I will meet them separately or together.

[fol. 510] In my cross examination I was asked whether prices of certain things had increased since the data of my inventory. I recall that, and I answered those particular questions that were asked me.

In general, there has been in steel and cast iron a slight reduction since June. On the other hand, there has been an increase in skilled labor costs, and taking this property as a whole, it is my opinion that there would be very little, if any, difference between the cost to reproduce as of today and the cost to reproduce as of June.

The other day I said that there had been no reduction in gas meters. I find, as a matter of fact, I was mistaken, and that there was a reduction of thirty cents on a 5-light meter January 1st, and a pro rata reduction on all other sizes.

The steel plates were reduced from 1.5 cents a pound to 1.4 cents some time in February, as I recollect it, and structural shapes within about two weeks. Cast iron pipe was reduced slightly in December, which reduction has continued, that is about five per cent. I did not give the amount of the increase on the labor. The increase is from 50 cents to a dollar a day, varying with a different classes of labor. For instance, if there has been a reduction in steel prices or iron prices and an increase in skilled labor, I am sure it would not affect boilers, because prices on tubular material in steel have not changed. The generators it would affect to some extent because the mason labor has increased and the boiler makers have increased. Just [fol. 511] exactly what the amount would be I have not made an estimate and could not say exactly. Boilers are sold, generally on a horsepower basis. These are water tube boilers. I know what I include boilers here at. I did not list them in my schedules here on the unit price per horsepower. I gave a price for each boiler. The makers bid on them generally on a flat basis, but back in their place in making up the price they usually considered the power. The 264 horsepower boilers, the largest ones, figured at $42. Those are the boilers in this plant that I am talking about. The 215 horsepower are $43 per horsepower, and the 106 horsepower boilers are $45 per horsepower.

I did not say that there was not any change. I said I did not think there was any reduction. I think it may have increased slightly, but I am not sure, because I know that boiler tubes have not been reduced in price, and there is a comparatively small amount of steel other than the tubes.

I have been interested in prices in connection with gas manufacturing about 35 years. Since I have been with the Bartlett-Hayward Company I have been familiar with those prices. I have followed that very closely. I have knowledge of the trend of the prices on this class of material in recent years. I have had a knowledge and it was accurate at that time, but I don't remember the prices of all this kind of material. In 1920 it cost the most to build a gas plant. That has been the highest or what I might call the peak of prices during the last 35 years. The lowest period since that time, was in June, 1921. 1923 was not as high [fol. 512] as 1920.

Taking the principal item in a plant; take purifying boxes, for instance, they went up about 2.3 times the 1913-1914 prices, in 1920. Purifying boxes are now about 2.15, that is fairly close, but taking cast iron condensers, for instance, they went up to nearly 3.5 times, and now it is only about 2.3. Taking the gas holders, gas holders went up to about 2.3, always using 1913-1914 figures as a base—they went up to about 2.3, and now they are only about 1/75. Shaving scrubbers which are also made of sheet metal, they went up to about double the 1913-1914 prices, and now they are about 1.9. They got up to the plane as high as they were in 1923, along in 1917 and 1918.

These items did not run close together, but cast iron condensers went up first more rapidly than the others and a little earlier. Holders and scrubbers came along a little bit later, but this was all in 1917 and 1918. Indicating from the sheet of paper I have here, I have brought it down with reference to those prices, January 1, 1924 or December 31, 1923.

The trend of prices are made by us. I would like to call attention to that, because I wouldn't want to prejudice anybody else. Taking the gas holders for instance, we have very greatly added to the efficiency of our shop, so that today our shop labor on a gas holder is no greater in cost per pound than it was in 1914, when we were paying only about on'-third or less than one half, rather, the cost per [fol. 513] man; so therefore these curves are distorted by the Bartlett-Hayward increase in efficiency, and if anybody else who had a shop probably that had not been changed in layout would make a similar curve on a gas holder, it would be a different form from this one. In other words, the present prices would be higher, compared to 1914, than our prices are. I make that statement because somebody else may produce one some day and it may be out of line. Our shop methods have increased considerably in efficiency and, keeping that in mind, it is accurate.

(Received in evidence and marked Defendants' Exhibit No. 3.)

That exhibit No. 3 starts January 1, 1913. I used that date because I wanted to get a base line to start with at zero, and that shows about a year of uniform prices, and

then the prices began to rise after that. That is the date of a period of uniform prices, and the Bureau of Labor used that as the basis from which to measure in their index numbers. They turn out what they call a price curve. That shows the comparison between the prices on some couple of hundred commodities, using 1913 as the base or 100 per cent. I have one brought down through 1922. I haven't brought any later than that. I have Dun's Index brought down to date. Here is one from 1860 to July, 1923, by years and then here is one from January, 1921, to February 1st by months. The first one I mentioned covers from July [fol. 514] 1st, 1860 to July 1st, 1923. It is the price on the first of July of each year, which is generally the lowest period of prices in the year. I don't know how many commodities I have in there. There are several hundred. That is not the index number, that is the purchasing power of a dollar based on that. It is practically the reciprocal of the index number, the purchasing power of a dollar. I have the index numbers here on which that is based. The average cost of the articles in there. I could not give you you all of the items. It is supposed to be the consumption of an average family. The basis is supposed to be like the Bureau of Labor, and it runs fairly closely to the Bureau of Labor Index.

There has never been a period of time since the manufacture — automobiles began when I could purchase so much automobile for the money, and also rubber tires. They pay more for the fuel, and so forth, but it is because of the organization of the business. They have gotten it on a manufacturing basis which they never had before, 1914. It is quantity production.

There is a vast difference of course in the quality. You see, during the war they developed these alloy steels and then they developed the quantity production, and the cheapness of the automobile is due a great deal to the experience gained during the war in the use of alloy steels [fol. 515] and in the matter of quantity production by gauges. There is no fitting of parts, every part is made to gauge and they put them all together; they don't have to fit them, and it has gotten labor down to an absolute minimum. In 1920 and 1921 automobiles were about the most expensive things in the market. You could hardly

get even an old one. That was due to supply and demand. They were short on stock at that time, they could not make deliveries, and they put on all the market would bear. There is a period there in 1922 when plaintiff's plant could have been reproduced for something less. Of course in 1917 it was lower than it is now, and 1920 was higher.

In 1921 there was a period there when it could have been reproduced at somewhat less than now. That was due to a general cheapening, a general slowing up in price, depression in prices, which affected labor to some extent, not very much—skilled labor was not affected. It was largely a question of business depression, a drastic depression. I mean inflation in the volume of loans, the loans—the calling of loans, that is the way it happened. The loans were called and the people had to unload at any price. Business recovered. We have not been in any inflation period since, but business recovered and adapted itself to it and went ahead, although it was a rather painful process while we were going through it. If we should have another deflation [fol. 516] it will drive prices down again. It might, and it might drive somebody out of the country.

In my business now we figure how it will affect our business in making improvements to our own plant. When we get an order to build a holder, we do not worry much about the future, but if the question comes up as to extensions and improvements and changes in our own plant, we make a very careful study of conditions and possibilities of securing business.

I am able to express an opinion as to whether the cost of making gas-making machines will be higher or lower in the next five years. Of course I can not be as positive about ten years. I have my opinion, but I won't be positive. In the first place my opinion is based on the fact that in the history of labor it has never been liquidated, and all prices are predicated on labor. Practically everything that goes into a piece of gas-making machinery, taking the coal back at the mine and the ore back at the mine, everything is labor, and transportation is largely labor. Now, labor cannot be very greatly reduced, as far as we can now foresee, by labor-saving machinery, so that I cannot see any reduction in cost due either to reducing labor, rates of pay, or in greatly increasing the use of labor-saving machinery,

in building a gas plant, and I don't believe that there is going to be any radical change in costs in the next five or ten years, certainly no radical reduction, and, on the other hand, I do not see how there can be any radical increase. To make a reduction, it would be caused by a de- [fol. 517] flation of labor. Currency would have to be deflated first, but I know more about labor than I do about currency. It would be the deflation that would cause the whole reduction. I could tell you there is no economic advantage in the deflation of currency, but to express an opinion on that, I would be getting off my own reservation. There would be no economical advantage. Now, when I say I do not see how there can be any material increase, it is a fact that we are importing cast iron, we are now importing brick, and unless there is a great change in the foreign countries, any great change in this country will be followed by imports. We are just about on the point where we can afford to import cast iron and afford to import brick. Both of them however, have to come in as ballast.

I think we are in a stable condition. I do not think labor can get any more, because I think imports would stop it, so I think we are in a very stable condition. Of course, there will be a sloughing up and down of prices as we strike good years and bad years, as in 1914, but generally there will be no great variation up or down. Brick is being imported now , per thousand for $20 alongside. That is the current price alongside. I think it is Belgian brick.

What I say would apply to cast iron mains as well as the part of my equipment that I have included in my inventory, that is raw material for the mains and the cost of laying mains. I don't think we will reduce labor. Labor is what you use in laying mains.

[fol. 518] Around June 1st of last year, 1922, I testified that there was a very sharp increase in the price of cast iron at that time. There had been a rise, there had been a good deal of a fall previously, and it recovered and went somewhat higher than it had been. Then it declined again afterwards in December, slightly. December was more or less of a seasonal decline, but that has held longer than usual. There is ordinarily seasonal decline and it has held so that you can still get pipe at about December's price.

I have spoken with respect to my general equipment. What I said with respect to general equipment during the next five or ten years will apply as to cast iron mains; the same conditions would apply there. We are more or less stable in respect to those, and of course I say we want to be clear that that stability runs over a period, because there is always a sloughing up and down of prices temporarily, there always has been, but the general trend will be, I should say, about level for the next five or ten years, at least. I do not mean to say that after that time we will be back on the pre-war basis. On the contrary I think we will keep on going up. We have been going up from 1896 to 1914; then we went up very sharply and fell back again. Now, I think we will keep on going up until we get to a point where the extended curve from 1897 to 1914 would [fol. 519] meet us, where that curve about picks up with our straight line; then I think we will keep on up. I mean if we keep on the same increase, on the same incline we did from 1896 to 1914, we would be a little below where we are now, but not very much. I was speaking of prices from 1896 to 1914 generally. They affected our business in two ways; they affected our market and they also affected our own costs. Our costs were going up just the same as the general trend of prices.

The material and labor that goes into the gas works has gone up somewhat faster than other prices, because of the large amount of skilled labor that is used in building a gas plant. Skilled labor has gone up faster than the average prices. The curve shows the purchasing power of the dollar with respect to these foodstuffs, the same as it does with respect to gas plants, all of the material that is used—the average value of everything, including gas, coal. R. G. Dun uses for that determination, foodstuffs, wheat, corn, oats, rye, barley, beans, peas—oh, there is quite a list here. I figured from Dun's index the purchasing power of a dollar. I just took his index and divided the current July 1st, 1913 price into the index number of 1917, and that shows the purchasing power of a dollar. I divided the current index, then I have a ratio. It is the reciprocal of the index number, using July, 1913, as 100. That is about the basis of it.

They use the average for 1913, but Dun's annual index [fol. 520] always uses July of each year, because July is the lowest price in the year, and here is his table of index numbers running back to 1860, and he used July of every year. That is the reason in making up my table I used July, because Dun uses it in publishing his index numbers.

The Master: I don't think it is very important, but as long as it has been produced in connection with the testimony given by the witness, the objection will be overruled and the exhibit will be received. The yearly curve will me marked Plaintiff's Exhibit No. 70, and the Monthly curve Plaintiff's Exhibit No. 71.

(Received in evidence and maked Plaintiff's Exhibits Nos. 70 and 71.)

These last two exhibits were made under my instructions by my immediate orders. Those curves that have been received were prepared under my direction.
[fol. 521] In my exhibit No. 39, giving my valuation of structures, I made a foot-note reading "No allowance has been made in the above for the values of the easement, franchise, going value, or any other property not specifically mentioned." Going value is the difference between the value of an operating property with an organized plant and personnel and serving its customers and having regular dealings with them and a plant which is merely built and not operating, having no customers and doing no business.
I say the going value is the difference between the plant as a whole, not operating, without any customers, not doing any business, not operating at all, not having an operating organization, but just ready to get an operating organization, get customers and begin business and a plant as a whole operating efficiently. In other words, the cost of hitching up the plant to the consumers. There is a difference then, in the value of those two plants and of course your plant comes in the category of the one with the business and the customers.
Your company has about 50,719 meters set as of June 1st. [fol. 522] Some of them are very large ones; some use very little. As far as consumption is concerned they use an average consumption. You have an average consumption

per meter. The figure in my mind as to just what constitutes an average is about 30,000 cubic feet per meter. You have something over 30,000. That would mean under dollar gas each fellow would pay about $30 a year. I have considered the item of going value in your plant.

That difference between these two plants that I have told about—our plant with customers and doing this business and the same kind of a plant without any customers, I get at the value by estimating what it would cost to restore the going value and attach the business. I have had a great deal of experience in getting customers and seeing how fast they come in and what it costs. It takes time to get them on. I assume that each one has some other method of lighting his house and heating his house and that he is not using gas and you have got to convince him that he has got to quit that former system and take the new one, for the various classes of service, too, not just one, but for cooking, water-heating and laundry use, and various uses of gas. Then in this going value I take into account that the company has got some of its customers using gas just for cooking, others using it for cooking and heating water, and some using it for illumination, and some possibly using it for heating.

[fol. 523] I take in all the different classes it has and I have come in contact with the building up of that sort of a business in the East River Gas Company of Long Island City, and the New Amsterdam Gas Company, and the Consolidated Gas Company of Baltimore, the Hyattsville Gas & Electric Company, with all of which I was immediately connected, and from observation in other companies. I was consulted in the Japanses Company, which was built up this way—a new company in an established town. My brother built up the plant at Osaki, Japan. I was quite familiar with that. That was a city of a million people that never had any gas. He put in a new plant and started in to develop the business.

I am aware that in your territory when you lay a main you do not lay a main until there are houses on the street, until there is somebody to use it in that street. That is usually so. I suppose so. I would assume you did that. Some of those people come right to you for gas. I don't imagine that all of them do. They need solicitation, not

for a cook stove, but for other purposes. In order to get an account so that it is a good account, we have got to do something to get them on to the heating of water. That helps a great deal. I do not mean that is necessary for a good account, but it helps to increase the load—sales per meter. I have arrived at a unit cost of that; the expense per unit to a company in getting it together.

[fol. 524] The carrying charges, of course, would be included, but it is not, of course, a loss in the ordinary sense. It is part of the cost of carrying a property while you are in the development stage.

This territory, the 30th Ward that you are serving, built up as it is now, is a suitable territory for a gas plant to be located in and a gas plant in such a territory should be able to furnish gas for these different uses which I have mentioned at a price so that you might be preferred over other kinds of service.

Such a plant would start, of course, without any organization other than what organization was there during the period of construction. The construction being completed that organization then becomes complete. The only place to charge the carrying of it would be in the development of the business. Then the plant is started and the canvassing organization would probably be started before the plant was actually put into operation, and the company would then canvass for business, advertise, and as it gets its business run its services, connect its meters and turn on the consumers. During a period of two or three years the expense of maintaining the organization would not be returned [fol. 525] out of operations. I mean the organization which is trying to secure the new business, at the same time operating the company for the business it secures. An organization has two purposes, the securing of the new business and the operation of the company for that business which is secured. Then the new operating organization, of course, must be trained to efficiency. We first start with too much labor in the cost of the operations and gradually, as they are trained, the labor goes down. There is too much material used in the making of gas with a green organization. That is gradually drawn into shape. Then, in order to build up the business rapidly a good deal of advertising is necessary, considerable canvassing, and in many cases inducements

to the customers to come on rapidly, such as the loaning of appliances, or, in some cases, as is known of, they actually gave them appliances. Always sold them at a loss during that period. The loss on sales of appliances, the expense of advertising and canvassing, the cost of organizing the plant and the personnel, would all be found in this cost of commencing the business.

The rate of gas that you use when you get your business ought to be the rate that you are going to keep. The gas rate ought to be the one that you are going to maintain and that would be something then, that would pay operating expenses when you did get the business and a return on the investment. I would not get enough business the first year so that I could pay operating expenses and get a re-[fol. 526] turn on my investment.

I said first, you know, that I would put in a rate that I desired to be permanent and then when I got all our business on I would have a certain income from that rate. I would only get up to that income when I got all the business on. In my judgment I would say it would take a long, long time. The first year I would think I would lose all our net earnings, that is, I would not have any net earnings. The second year, I probably would have the same. I would probably pay operating expenses at the end of the second year and possibly a little more.

If I am going to build the entire plant before I start, I would have to assume that I would build it in two or three years. Practically, of course, I could not, but in this estimate I have assumed that I would build in two or three years; that I would get all of the business in two or three years. This thing, the amount of business the company has and the going value that is in it, is a matter considered in the ordinary every-day transaction. It is an important factor to the extent that it has a good deal more value when they get your business and can show your history than as a construction proposition when you have nothing behind you; you have got to get the business after you buy the property or build the property. I have told you all [fol. 527] the main factors that I have taken into account in estimating the going value of this plant.

I have never looked into your accounts for the purpose of informing myself as to what it has cost this company to

acquire its business. I never have done anything on that subject. This expense that appears on the books, promotion expenses—properly kept now; assuming it is properly kept that would come in under Promotion Expense. I assume that covers advertising and canvassing.

I have never examined the records of any company to find out what the cost of establishing its business was. I do not know that I have. It is a useless sort of an operation. I mean by that, that the cost of organizing the personnel, failure to earn a return during the period of organization, does not appear on the books. These costs are just not there in that form. It would not show if you examined them. So I have never examined them for that purpose, knowing I would never find them.

In my opinion, the going concern value of plaintiff's plant doing the business that it is doing, is $1,775,095. That is $35 per meter, and I made a mistake in reading the number of meters a while ago. Instead of 50,719, as I stated, it is 50,717 at $35 a meter. And that now, from what I said, means that this plant with all this business is worth the amount I have stated there more than the same identical plant just ready for operation but without any operating personnel and without any customers.

[fol. 528] Kings County Lighting Co.

March 20, 1924.

ROBERT R. BOGIE

Direct:

I am the Chief Engineer of the Kings County Lighting Company and have been with the company since the 1st of May, 1918. I held the position of assistant engineer doing construction work and operation work at the plant of the company at that time. I do not remember the exact dates but later I was made engineer in charge of operation of the plant. Sometime later I was made Engineer of Manufacture in charge of operation, maintenance and construction of the plant, and also maintenance of the Distribution Department, holder station and machinery and

equipment. In, I think it was, March, 1922 I was made Chief Engineer of the Company in charge of both the Production and Distribution Departments.

The Production Department consists of the handling of all fuels and materials used in making gas, the actual production of gas, maintenance of all equipment, buildings, and the making of the gas and putting it into the holders at the Distribution Department. The holders are distribution equipment, more than manufacturing equipment. They are storage equipment. The Distribution Department consists of the storage of gas, supervision of the operation of the holder station, the operation of such valves and equipment and engines and boosters as are neccessary in order to distribute the gas from the holder to the consumer. It [fol. 529] also consists of supervision of the mains, services and meters, and the construction of new mains, the laying of new services and the installation of new meters. I have a Mechanical Engineering Degree from the University of Vermont in the year 1916.

Before coming with the Kings County Lighting Company I was first employed by the Central Union Gas Company at 138th Street; later I was employed by the Consolidated Gas Company at their 21st Street Station; in the manufacturing departments in both instances. At the 138th Street Plant I started in as cadet engineer. The work consisted of various jobs, such as cleaning fires and operating gas machines making gas analysis, some office work, chemical work and also operation of the coal gas plant as well as water gas, and later supervision of the coal and water gas.

I have seen Mr. Burt's inventory of the buildings at the Kings County Plant. All of those buildings are in full and complete use by the company. I have looked over the inventory of Colonel Miller with respects to works machinery and equipment, and the holder equipment and the shop equipment. Everything that Col. Miller has inventoried there is in use by the company and was during 1923. There are some minor items that he has left out of his inventory that we were not using. I know Mr. Duncan. He lays some mains for the company. We have mains in the streets. I have in a great many instances since 1918, come in contact with some of the mains where we actually laid mains and [fol. 530] repaired mains so that I know that there are mains

which are in use. I found in every case where we had reason to repair a main that there was considerable gas in the main, and we repaired it because we were using it and a leak developed, or something of that sort. We make the gas in the gas machines that Col. Miller has described in his inventory here and I have charge of the manufacture of gas. I have subordinates and assistants. We have an Engineer of Production, Mr. Titus. He is at the plant and we have an Engineer of Distribution, Mr. Cuthrell. I am Chief Engineer over both departments and have these two divisions for more perfect organization in getting the work done. We make carbureted water gas and have done so all the time I have been there. Other kinds of gas that may be made are coal gas and oil gas. The principal materials used to make carbureted water gas are either coke or coal, oil, steam, I might say air, we use it in the process, but it does not appear in the gas, and labor. The gas made depends on the standard you are operating under. You can make it of various qualities. At the present time we are operating under a 537 B. t. u. standard. A B. t. u. is the amount of heat required to raise one pound of water one degree Fahrenheit. The initials mean British thermal unit. It is the way of measuring the heat content of gas. That is the unit of measurement. We ascertain the heating quality of the gas by determining how many B. t. u.'s it has in it, [fol. 531] in a cubic foot of gas and we determine how many it has in it by how much work it will do in the way of heating water, raising water to a certain temperature.

Gas depends upon the standard of quality, the make depends upon the standard we are operating under. We are operating under a standard now and getting a certain kind of heat content in the gas, but it has been manufactured in the past on the candle-power basis, illuminating value. We are not struggling for that at the present time. Since I have been there, we have taken the illuminating value of the gas produced, but we never operated actually for an illuminating standard. I said I only went there about May 1918 and at that time the company was not operating and turning out gas for its illuminating value, but rather for its heating value and has always continued that. During my first years with the company, I had something to do with the making of gas and the manufacture of it. I got to the ac-

tual supervision over the machines; I think I actually did some repair work and operation work of the machines. We have given the subject careful and actual consideration as to the quality of gas we are making and how best to make that quality of gas and maintain the standard, ever since I have been with the company. It has been a question of a controversial point ever since I have been with the company, the quality of the gas we were making, so as to be at the forefront all the time. The standard we are striving to [fol. 532] maintain at the present time is 537 B. t. u.'s per cubic foot on a monthly average basis. We took that odd number, 537, because that was the standard set by the Public Service Commission. That is the order of the P. S. C., I think, which has been received in evidence, and that is the reason we are doing that. The factory method of determining the heating value of any gas is by burning it in a calorimeter and determining the heating value. That is a testing machine. It is a Junkers Calorimeter, a standard, and we have two of them, one at the works and one at the shop at 65th Street and 9th Avenue. The present gas that we are making differs slightly between the two places, from about 3 to 5 B. t. u.'s. It is measured at the Distribution Department, 65th Street and 9th Avenue. At the outlet side of the holder. We have been trying to make 537 B. t. u.'s gas since that order was passed. I have forgotten the exact date of it. I think it was all during 1923 anyway. We take several readings every day of the B. t. u. content of the gas at both places. The Public Service Commission takes tests at the 65th Street and 9th Avenue shop at any time they want to go in there and take them. They have taken tests practically every day; in fact, sometimes two and three tests a day. We have a record of what they find. Every test made they communicate, either leave a ticket showing the result of their test, or communicate the result to us within twenty four hours. The fellow who goes out there uses our instruments. The first thing the inspector does when he comes in, he checks up all the connections and the height of the water [fol. 533] in the meter and checks the whole calorimeter over for leaks or so forth, to make sure it is correct. This calorimeter was installed by our company. That order says something to the effect that the measuring instrument shall be installed under the direction of the Commission or su-

pervision of the Commission and this was put in under their supervision. When they go there, they leave us a slip stating the heat content, but they do not enter it in a book. They just give us a little ticket. I have the tickets with me. Whatever condition the gas is in, the result is shown on this ticket. I don't know how many there are. I imagine about four hundred of them, practically. From January 2nd, 1923 to December 21, 1923 is the last one I have here. We make tests at the same location every day. I would not say stated intervals, they vary considerably. The tests show that the gas is of different quality if you took three tests during the day. You would get a slightly different figure each time. We take an average of the tests made that day and that would be the average for the day. It is not a weighted average. It is the average of the tests taken, on the outlet side of the holder.

All tests made by the Commission and made by the Kings County Lighting Company, all tests made for a particular day were average, which figure was taken as the daily average for that day, and for each month the average of the daily averages were taken and represents the average for [fol. 534] the month, and I have a sheet here that shows the averages for the months during the year 1923, both the Public Service Commission's monthly average and the Kings County Lighting Company's average. The daily averages are not there. To put the daily averages down it would be 365 readings, and I have not compiled those. That sheet Counsel has is a sort of a summary of the Public Service Commission tests showing the monthly average and the maximum daily average during that particular month and the minimum daily average during that particular month, but this other sheet that I brought here shows the monthly averages by our readings and by the Public Service Commission's.

(Marked Plaintiff's Exhibit 72 for Identification.)

The list on this Exhibit 72 for Identification headed "Public Service Commission monthly average," is a compilation made by me or under my direction from the slips I have in front of me (indicating). Taking our monthly averages from our own tests, which are entitled "Kings County Lighting Company Monthly Average," we have

two men who take them under my direct supervision, and sometimes within an hour, sometimes not until the next morning, sometimes two hours after the test is made I know about it. The object of making the test is to maintain the standard at the distribution department. If the Com- [fol. 535] mission said we would have to furnish a 500 B. t. u., we would make gas on the same basis, but the quantities of oil and so forth would vary; they would be increased. The fellow that is making it is instructed as to the amount of oil and how to operate his machine, the cycle and so forth. He is actually working under the foreman, who tells the man who runs the machine how much oil to use and how much coal and how much coal and how many cycles and how long the cycles and all that. The foreman directs him. The foreman gets it from Mr. Titus, the engineer of production and Mr. Titus and I confer about it and reach a determination as to what shall be done. The quantity of oil that will be used and the length of run and all that is predicated upon the kind of gas we want to make, it is a cut and try method, and the method differs continually; in fact it is a continual cut and try with various grades of oil and various grades of fuel. If we are not mainta-ing our standard or if we get a poor run of coke or poor run of oil, then Mr. Titus and myself go down and watch the operations and put the machines in proper operating condition, and then the foreman is instructed to keep them in that method. It can be figured out with a pencil very closely but the actual operation needs experience.

We have a Thomas calorimeter there which we use for operating control. It is not used as a final test of the result of the gas made. That test is made at 65th Street and [fol. 536] 9th Avenue. But the Thomas calorimeter gives a continuous record of the gas we are making at the works.

(Plaintiff's exhibit No. 72 for identification was thereupon received in evidence.)

In other words, there is no month here in which the gas was less than 537.

We have made other kinds of gas down there than what we made in 1923; that is, we have made it at a higher and also a lower B. t. u. standard. There was quite a while that we were making around 590. We were somewhat above

that when I first went there and then we changed it. We came down to about 585 and we made another change later. We came down to a minimum of 525, as I remember. It was a gradual process of dropping down. That was the first order of the Public Service Commission. Then we went back again, we raised the quality under the final order of the Public Service Commission, so we have run the gamut there from 590 down to 525 and back to 537. We have at some time made gas at every stage between those limits and studied it all the time, as to how to do it,—As to how much oil to use and how much coal to use and how long a cycle and all that.

This Exhibit No. 49 states in one column the quantity of material per thousand cubic feet made, that is, the final or last column on the righthand side. It is stated there that generator fuel was 33.98 pounds per thousand cubic feet; boiler fuel, 5.24 pounds per thousand cubic feet, that is [fol. 537] solid boiler fuel, and for water gas tar, it was .25 gallons per thousand cubic feet, and gas oil 2.83 gallons. When we made a different kind of gas, 580 or 590, all of those quantities differed from what they do here. I mean to say each time we made a different kind of gas in 1923, they would have varied and if we went up to 650 B. t. u. gas, the gas oil would be increased and the generator fuel would decrease slightly, and the boiler fuel would be decreased slightly, that is if we use more gas oil. We would use less generator fuel and less boiler fuel per thousand cubic feet of gas. Residuals would be increased, then there would be a larger credit. We have not made 650 gas since 1923. From my actual experience in making a higher B. t. u. gas both with the Consolidated Gas Company and from tests made at our own plant, I have figured out what the variations would be in these quantities, so I am going to be able to tell, if there is no objection made or sustained, as as to how these would vary, in my judgment. We could not take a week, make 650 B. t. u. gas for a week so that we could then come into court and show them how much more it would cost on account of the variation in the gas going to the consumers. If we made 700 B. t. u. gas one day or one week, and the next day dropped down to 600, there would have been a great variation in the gas supplied to the consumers, and it would not have been efficient opera-

tion, it would have been dangerous. We could not have changed from one week in September, say—that is, distribute 650 B. t. u. gas for one week and then distribute 537, [fol. 538] say, the next week. We knew how, but it would not have given the consumers a gas that they could use in their appliances as adjusted. We could not safely put 650 B. t. u. gas in their appliances. That is, if the appliances were adjusted, for instance, for a 540 or 537 B. t. u. gas and we produced a gas of 650 B. t. u.'s or 600 or 670, whatever it might be, the appliances would not consume the gas properly. There would be a lack of air there for combustion, a lack of primary air. It would not have worked, in my judgment. It would not have done any good to put a notice in the paper telling all those people to change their appliances, that we were going to try out a different gas for a week. The majority of the consumers don't know how to adjust their appliances, and then also a great many of them have appliances of such a nature that they could not adjust them. In my judgment, it was impossible to make a test of this thing since June 1st, of 650 B. t. u. gas on a basis of that sort. It was a possibility to go out and change their appliances for them but it would mean that a considerable period of time would be wasted until the appliances could be adjusted or replaced. We could not adjust them all at once from 537 to 650 B. t. u. gas nor make the change from 537 gas to 650 gas in one step, in any event. All of our appliances would have to be changed at one time. I would not say that all the appliances in our district were capable of adjustment, so that would be one reason why we could not have made the adjustment. From my experience and [fol. 539] computations, the increase in the quantity gas oil in 1923 per thousand cubic feet comply with the standard of 650 B. t. u.'s instead of the kind of gas we did make, would be in 1.82 gallons per 1,000 cubic feet made. That would have raised it from what we have here, 2.83 to 4.65 on the make. This amount that we used in 1923 for making gas is a very efficient figure, efficient operation. That is as low as we could have gotten. The quantity we have to use to make a certain quality depends upon the quality of the oil. If the quality is inferior, we might have to use more. There is a decrease in the boiler fuel of approximately 1.26 pounds of bituminous coal per thousand cubic

feet of gas. The decrease depends upon what fuel we were using. If the unit was solid fuel instead of 5.24 pounds, we would have about 4 pounds of solid fuel. That would be the only difference. The other is the boiler fuel, water gas tar and that doesn't change at all because we endeavor to use all that we produce so that has nothing to do with the factor at all. In working this out, we figure no difference in liquid fuel. Assuming that in both cases we would use [fol. 540] .25 of a gallon water gas tar. In the generator fuel, there is a decrease of 1.98 pounds. That would give about 32 pounds of generator fuel. I have the experience to see that these do change as we have been making gas. Sometimes machines in one year are more efficient than in another in making gas. That is, our machines, are more efficient than they were before we put in some improvements, so you really cannot take this on an historical basis unless you know the machines are the same as they were for the making of gas. If you use more oil, you put more hydrocarbons into your gas and it produces a higher B. t. u. The oil is gasified in the generators and a gallon of oil will gasify into a certain amount of gas. The amount of gas you get per gallon of oil put into the machine will vary with the quality of the oil, and various other conditions. There would be a decrease there, even though you are making a richer gas. You use more oil, but you use less coal in the generator because you get part of the gas that accrues as a finished gas from the coal or coke that you are using. The balance of it is produced from the oil that you use. If you put more gas oil into it there is naturally less gas from the coal, the blue gas, as we call it. The gas that is turned out is a mixture of oil gas and blue gas made from the generator coal. If you want to get more B. t. u.'s the way to do it is to put in more gas oil in proportion to the blue gas. In order to get a richer mixture, 650 gas, we will call it,—you increase the amount of gas oil and decrease the blue [fol. 541] gas which accounts, in part at least, for the lessening of the generator fuel. The fact that you are producing more gas from your oil and a smaller proportion of blue gas per thousand cubic feet, would naturally decrease the boiler fuel. The blue gas is made by pushing steam through an incandescent surface or mass of coal or coke and from that you make the blue gas and if you enrich the

mixture you do it by putting in more gas oil and having less blue gas per 1,000 cubic feet. The quantity of oil used for whatever purpose—any variation in the quantity of oil ought to have a variation in the residual and if you are using more oil and making a richer gas, you will have a more efficient character of oil in the carburetter, and it will produce more water gas tar. You also have more gallons of tar for the same number of cubic feet of gas, by reason of the fact that you had used more oil in making it. I figured about 15 per cent of gas oil back in the form of tar. In case we make gas of 650 B. t. u. I mean 15 per cent of 4.65; 15 per cent of the quantity of oil used. We base the amount of water gas tar recovered on the amount of oil used and, in the case of making a 650 B. t. u. gas, you would recover approximately 15 per cent of you- oil in the form of water gas tar. That same percentage would not apply to the amount of oil used in making 537 gas. Approximately 5% of water gas tar I think was recovered as a residual in making 537 gas during 1923, so that the more oil you use increases the percentage of residual through the more inefficient operation of the cracking process of the oil in the [fol. 542] carburetter. That would not mean that a gallon of oil, where it is put in to be gasified in the process of making 650 B. t. u. gas, would gasify to the same extent that it would where you were making 537 B. t. u. gas. In one case you have .85 that would stay in the gas, and with 537 gas you get about .95 of a gallon in the gas. At 650 you cannot gasify as much as you can at 537, or as much won't gasify in that process. For one thing with the 650 B. t. u. gas you get a evry highly saturated condition of your blue gas. In other words, the blue gas is really a medium for carrying off the hydrocarbon oils that you put into the carburetter or into the gas. When you get to a certain point of saturation, you cannot add to it. The gas is carried as a vapor or fog instead of a true gas, so that on the higher B. t. u.'s you are putting more gas oil in, and part of that gas oil drops out as tar before leaving the manufacturing point.

I have worked with Mr. Gonnoud on how this would have affected our operating expenses last year. We have prepared a statement and this is it.

(Plaintiff's Exhibit No. 73 for Identification was thereupon received in evidence.)

I think the exhibit is fairly clear. Take the first line, gross amount paid for the making of gas in 1923 and the [fol. 543] cents per thousand for the making and delivery of the gas, 91.38. Oil at that time was 2.83 gallons per thousand cubic feet of gas made, a certain number of gallons at a certain price. The next figure is the gas oil required to furnish the same amount of gas at a standard of 650 B. t. u's, 4.65 gallons per thousand cubic feet of gas at a standard of 650 B. t. u's. It states the amount of gas at the same figure, and the total of that amount is carried out. That is extended and then the difference between the two figures is further extended. In other words, that $187,037.05 is the amount it would have cost us for gas oil to make 650 B. t. u. gas in 1923, instead of the gas that we did make—the amount of the additional cost. The items set forth in the third column from the right hand side, the boiler generator fuel, $17,575.58—that is a reduction; boiler fuel, $10,354.91, which is a further reduction. Then water gas tar produced, $57,282.60. That is an additional reduction; that would be the increase in the value of the residual. The total of those amounts is $85,213.29. The increase for oil is 10.42 cents per thousand and the credits amount to 4.75 cents. That makes a difference of about 6 cents, that is .0567 or 5.67 cents. It is 567-10,000ths of a dollar or 5.67 cents. This difference here that I spoke about, is due to the prices we paid for the oil and the coal last year, figured on that basis. For instance if oil was cheaper and coal was higher, the difference would be so much, our credits would [fol. 544] be larger and so forth and so on. We have attempted to make gas down there last year as chealy as it could be made but I don't buy the material. We are making it as efficiently as we can, that is, we get as much out of a pound of coal or a gallon of oil as possible. There is a spirit of rivalry among the engineers to see what the other fellow is doing across the street, and in that way make a comparison as to whether they are getting good results. I am kind of looking around yet and in my judgment I would say we had had exceptionally good results last year. That is, we could not have got along with less oil per thou-

sand, in my judgment or less labor. We did not have any idle hands down there at our works nor in our Distribution Department. We keep a very close check on the labor situation. We have put in labor saving devices, which decreased the number of employees somewhat. We have coal handling equipment to replace the labor that we used to use in hauling buggies and so forth of coal. It is not shovelled except where we are trimming the last ton or so of coal out of a boat. I mean to say that our coal is handled right from the barge into the gas-making machine without a man using a shovel and the oil I know for several years has been run in pipes right into the gas machines. The boilers are sup-
[fol. 544½] plied with Cox stokers; the ashes are dumped into the ashpit and are taken from there and conveyed by a conveyor to a hopper. It is a steam jet system that blows it into the hopper.

The generators can be handled by manual manipulation, but we have automatic control machines there that actually do everything that a man will do on a machine; they will operate the machine and are not only labor saving devices, but they give you very uniform conditions in machine operation that you cannot get with the human method. The carburetted water gas process is an intermittent process; when you start up the machine you first have to light the fire in the machine and blow air through it until you get the temperature of the generator, carburettor and superheater up to the proper point. That is forced draft, the air going in under something about two pounds pressure. Then the air is shut off and the exit valve, what we call the stack valve from the set which permits the products of combustion to pass out into the atmosphere, is closed. That is done by an automatic machine but formerly that was done by hand operation. It is done automatically in our works, that is, that forced draft is started up automatically and the valves are opened and closed and so forth, the whole operation of the machine. During the blast period there is no oil. That blast is used simply to heat the whole machine, the fuel bed and the other parts of the machine to the point where we can begin making gas. Then when the blast is shut off, the machine is closed up by closing the stack valve at the outlet [fol. 545] and steam is turned in through the fuel bed. That is turned on automatically; in fact, the action is that when

the stack valve closes the steam is automatically turned on. That was done by hand formerly; when I went there it was done by hand. The steam is turned into the generator. For simplicity we will say it is turned into the bottom of the generator below the fuel bed and passes up through the fuel bed in the generator and from the top of the generator into the carburetor. Where the oil is sprayed in. The oil is turned on by the automatic machine and then the blue gas from the generator absorbs the hydrocarbons and hydrocarbon vapors in the carburetor and the resultant mixture passes over, through the superheater, and out through the seal or the wash box, as we call it, into the relief holder. All of these operations from the time we start our forced draft until we go through the entire operation and start our blow again is a cycle. A certain number of minutes and fraction of minutes for the blow and a certain number of minutes and fractions of minutes in the run; we have a certain number of minutes to a run; it varies under our operating conditions with our oil that we have, and the coal, it would be approximately 3 and ¾ minutes. With a 650 B. t. u. gas it would be lengthened out somewhat.

I have Exhibit 49 before me. I read the record with reference to the fact that about twice as much water gas tar was used in 1923 as was recovered, which would mean that we must have carried over some from the previous year. We carried over some tar we had in 1922, and we had it [fol. 546] there and used it in 1923, and if we had not used it, we would have had to have some other fuel. It would have been a solid fuel of some form for boiler fuel. I have looked into the question as to how it affects our 1923 expenses. Using solid fuel would not decrease the expenses any; it might increase them slightly. In other words, that tar we carried over from 1922 at the price we have got it here was just as cheap a fuel as we could have used in 1923 for boiler fuel. I figured that out so that I can tell in case anybody wants to know about it. There were some questions asked indicating that some other gas companies showed the production of a greater amount of gas tar than our record here shows in 1923. We did not try to keep up with our neighbors in that respect because they were operating on a different standard than we were, and the object, when we use gas oil, is to get as much of

it into the gas as we can and get as little tar return. I think it reflects that our efficiency was somewhat increased that we did not have more gas tar in 1923, but we might have had more tar if we had had a different oil or a different standard, that is if we were making a higher B. t. u. gas.

[fol. 547] ROBERT R. BOGIE

Cross:

I am a 1916 graduate of the University of Vermont and have a Bachelor of Science degree from that University as well as Mechanical Engineer.

We do not use water as a basis for making the gas. We use water in the form of steam. The temperature of our generator at the time that we put on this recurrent cycle of gas making runs in the neighborhood of 2600 to 2800 degrees Fahrenheit, maximum. Prior to the time that there is any gas oil added we do not have hydrogen gas entirely. It is composed of hydrogen and carbon monoxide and a small percentage of carbon dioxide and the carbon monoxide is a gas very similar to hydrogen. The carbon monoxide has a low heating content. We had just a trace of some marsh gas in there at that time; practically none. There is in the neighborhood of two hundred and ninety odd B. t. u.'s in a cubic foot of hydrogen and the number is somewhat less than that for carbon monoxide. I do not remember the exact number. Hydrogen is a very light gas and it burns with a non-luminous flame. To this 280 B. t. u.'s per cubic foot of hydrogen gas, in order to bring it up to 537 B. t. u.'s or 650 B. t. u.'s or 600 B. t. u.'s, it is necessary [fol. 548] to add what they call water gas oil or some form of oil; it does not necessarily have to be water gas oil, but that is what is used. It could be gasoline and the gasoline, if used, would go through a process very similar to that through which it goes in being utilized for the propulsion of an automobile. That is, it is carbureted and taken from a liquid form into a gaseous form. Marsh gas has a very high heat content per foot. As to whether carbon monoxide is a highly inflammable and highly ignitable gas depends on what you compare it with. If you haven't sufficient air to cause an explosion, it will burn and these gases known as 537 B. t. u.

gas or 600 or 650 B. t. u. gas, are all highly inflammable and highly explosive upon being exposed to the oxygen in a flame under the proper mixture conditions, and they are easily ignited, in this combined form of which I have spoken. For instance, if a gas escapes into a cellar and you go down there with a lighted lamp and the quantity there is considerable, you are likely to have a very disastrous explosion, if the mixture is proper, so that when such a gas is sent out to the consumer's premises, whether it is 537 or 600 or 650 B. t. u's and the proper adjustment of the air shutter is observed, there is no difficulty about igniting any one of those three gases, and they burn with a bluish flame, under a Bunsen burner. If the burner is not properly adjusted it has a certain flux of white flame in it, or it may be [fol. 549] and entirely yellow flame, which would indicate there was not proper combustion of the carbon elements in the gas and that would mean you should make a better adjustment of the air shutter at the point where the cock is, provided you could make all your adjustments at that time. We have another valve besides this primary air shutter. There is a valve on the range that you turn on and off. A needle valve might be used in place of the cock, but there isn't ordinarily any other valve on the stove or on the appliance. If you went to the W. H. Crane Company, to purchase a cock for a gas stove, you would get the orifice through which the gas went to one end of the cock. There isn't any valve there; it is simply an orifice, which is sometimes called a spud and the spud has a little hole at the end of it. If you have a lot of spuds on gas stoves in your district and you cut down from 600 to 537 B. t. u.'s, I mean as you come down in quality, you must make the orifice. In the type of appliance that has the spud it can be screwed [fol. 550] on and screwed off within a few seconds. In such appliances that the spud could be removed, I believe if you had a needle valve you could practically go to any range of B. t. u. content. A needle valve means an adjustible orifice of some sort, provided I get Counsel's idea of a valve. A needle valve is an orifice with a needle type of adjustment to it. So far as my knowledge goes there are all different kinds of valves on our appliances in the district of the plaintiff gas company. I have never seen a needle valve on gas appliances. I never heard of such a valve. I don't know about it.

[fol. 551] Kings County Lighting Company

March 21st, 1924.

WILLIAM A. MORRIS

Direct:

I am connected with the Kings County Lighting Company, the plaintiff, as Sales Manager. I have charge of the sales of appliances and the repairing and adjustment of consumers' appliances. The sales of gas and the sales of appliances are interlocked. In order to sell gas it is necessary to sell appliances. When I said I was sales manager, I meant to include both. I have been with the company since June, 1919, in the same capacity all the time. We have a department down there known as the Sales Department. It is New Business and Sales. The output of gas, the sales, has increased considerably in my time down there. We sell all appliances that are in demand by our customers or that will use gas, principally gas ranges, that comes first on the list; and that includes hotel and restaurant ranges and domestic ranges; water heaters of various sizes; room heaters. We sell a few burners for illumination. We have them for sale for lighting equipment, but the demand is not large. We deal in industrial furnace and large water heaters for industrial purposes and domestic purposes, and gas-fired boilers for both steam and hot water. There are some houses in our territory that we have sold and delivered and installed heaters in the whole building. We have some 22 connected that we know of. Most of them were furnished by our company. There [fol. 552] are two or three furnished by outside sources. Water heaters are not furnished by our company in the territory. They are sold by plumbers to a large extent. We try to promote the sales of those things. We advertise, and we do sell them. We have salesmen out that canvas the district with an effort to install water heaters and appliances. Our sales are increasing from year to year. I find from my experience there that there is a tendency of the consumers to use more and more gas water heaters and ranges; cooking ranges is a brisk business, at the present time on account of the extensive building. It is continually increasing. Our company is not supplying most of

them. I would estimate about 50 per cent of the new ranges that go into our territory are sold by our company. The builder usually puts them in the new buildings; part of the building. About 50% of the builders as a rule get them from our people, from our department; the higher class builders buy them from us. I mean the builder that is putting up the better class building. There are various qualities of those ranges. They vary in the quality of the construction, quality of the steel, the weight of the steel, the weight of the cocks and in the equipment. We do not handle all kinds or classes of them ourselves. We handle almost entirely the highest class we can buy, the highest grade. We are not satisfied to recommend the others to the consumer because we feel that our business is so interlocked with the consumer that it is for their advantage and for [fol. 553] our advantage to sell the highest type of appliances, so as to give them less trouble and consequently give us less trouble. About 50% of the builders buy outside. That is because they are able to buy, in most cases, a cheaper or lower grade of appliance than we would sell. That is one reason. And long terms that some of the manufacturers or dealers will give them is another reason. We have charge of the inspection of the appliances on consumers' premises and of the complaints that come in from the district on poor service due largely to the condition of the appliances.

I am the man to inquire from, as to the frequency of complaints from consumers. They all come through my department and I have men out that do the work and investigate all complaints. I do not think there is very much variation in the complaints we receive, since I have been there; they have neither increased nor decreased. They complain of leaks at ranges, leaks at appliances, poor supply due to dirt and grease that accumulates in the burners, or improper regulation of the appliance. Our department investigates all the complaints and remedies them, where possible. Some of the appliances are in such a dilapidated condition that it is not possible to remedy them without putting on new parts—leaky cocks and inferior workmanship in the ranges; it is impossible sometimes to adjust them properly. We have given special attention *the* the kind of burner that is on the various articles that are in our dis-

[fol. 554] trict. We registered all appliances at that time. Our department had charge of that. To accommodate and utilize the quality of gas we are now serving, I give special attention to the kind of appliances they have. We made a recent inspection of various sections of the district to ascertain the condition and the type of appliances that were being used. Our ledgers are divided into six districts and we took certain blocks at random in each district, so that we could inspect some of the new operations as well as some of the old ones. I mean, inspect some of the territory that would have the more modern appliances in and some of the older territory where we would get all kinds of appliances. Our territory was divided into six districts and we took about two blocks in each district: viz: Block No. 1: The north side of 42nd Street, south side of 43rd, east side of 15th Avenue, and the west side of 14th Avenue. Block No. 2: north side of 42nd Street, south side of 43rd street, east side of 10th Avenue, and the west side of 9th Avenue. We inquired for the number of gas-consuming appliances in each house. The inspectors made a list of the appliances—turned in a list of the appliances in use in each house, in each district. There were six districts sixteen blocks. There were a total of 1,404 appliances consisting of 1,024 gas ranges, cookers and hot plates. These are divided as follows: 514 ranges, 184 cookers, 326 hot plates. Cookers are a three burner single oven arrangement that fits in a very small space. A hot plate is a table [fol. 555] stove with two or more burners on it that sets on a table or stand. These three designations are some form of stove, cooking appliances. There were 312 water heaters, 42 room heaters, and 13 gas-fired internal steam radiators.

Room heaters are of various types. They are radius type heater or round cylinder heaters, reflectors. Among those would be the radius fire that we see in fireplaces. They are not all portable. Some of them, set in fireplaces, permanently connected; others are connected with tubing. The radiators are not portable. The radiator gives the appearance of an ordinary hot water radiator with a gas burner in under it. The idea is to heat the water that is in the radiator. There is a small quantity of water in there which is generated into steam and gives the effect of steam heat, rather than hot water heat. There is

only a small quantity of water in there, which turns to steam. Ours are all steam heated—steam is generated there. They aren't risky things in case they are blocked up. They are tested to about 200 lbs. pressure and it would be impossible to get more than 100 lbs. pressure from the small amount of water in the reservoir. There were 13 other miscellaneous appliances. My list does not show what they were. They might be laundry stoves, and nursery burners, gas irons. Some ironing is done by the use of gas. This report would show the internal heating irons, [fol. 556] not those heated on top of the stove. They have a gas tube running through them and they heat it that way. They have some that are called mangles where you use gas for ironing, pressing clothes. We have some of those in our territory. Tailors and jewelers and tradesmen of various sorts have a variety of appliances where gas is used in our territory. Tailors use largely gas fired steam burners for pressing. We had these appliances inspected in these territories, besides enumerating them, to see what kind of a burner they had. Not all of them are adjustable burners —adjustable cocks, so you can not change them for any kind of gas right in a minute. There are some that cannot be changed at all; about 21 per cent. of them. There are three different types—those that are adjustable by the turning down of a tap and a needle, you can adjust the burner. That is what we term the adjustable type of appliance, that is, you can increase or reduce the size of the orifice that way. Not all of them have a shutter on for the purpose of letting air in and out—ranging the air, but the majority of them have. When I speak of adjusting, I am speaking about enlarging or increasing the gas orifice. There is the adjustable orifice, the fixed orifice, which has a brass nozzle that goes inside of the cock. That is removable, and then there is the type that has a cast orifice. That is cast in the cock or manifold. That is neither removable nor adjustable. The size of the orifice cannot be changed, but can be enlarged by reaming. They can be enlarged for a lower B. t. u. gas and once done you cannot decrease it for a higher B. t. u. gas. They are enlarged by [fol. 557] a small drill or reamer that mechanics carry that ream them out to the proper size. I am speaking about a particular one now, cast, that cannot be removed. In the

list that I have here they were 21 per cent in this selected territory. That is just 21 per cent of things that we could not change for a higher B. t. u. gas; no way to reduce the orifice. The article would have to be discarded. That is 21 per cent of the 1,404 appliances that we inspected. That would take in all kinds of appliances whether stoves or hot plates or cookers or anything. There were some that had a removable orifice. 41 per cent had removable orifices but they were not also adjustable, except for the air shutter. They could be adjusted by the air shutter, but in order to reduce the flow of gas it would be necessary to change the orifice. That is, if the orifice were adjusted, reamed out for a leaner gas, we might call it, and you wanted to get a smaller orifice, the only way to do would be to remove this nozzle entirely and replace it with a smaller one. Those things are obtainable through the manufacturers. They are not a standard thing like a bulb, for instance. They have never been on sale that I know of. It would be necessary to have the proper size for your particular appliance that you wanted to change. The various manufacturers have various size orifices or nozzles so that you would have to purchase of the manufacturer nozzles to fit that particular range. For instance, if the manufacturer of ranges were putting stoves into Albany, he would be apt to put [fol. 558] them in with this nozzle adjusted to the kind of gas they were supplying to Albany, if he knew his business, but if he did not, his customers of ranges would not get good service and he would not sell very many. The manufacturers that we buy from have in their files a record of the kind of gas that we supply and when we order stoves from them, they turn to the record. We notify the manufacturers when we change the gas of our own accord so that our appliances will come equipped, and properly adjusted. 41 per cent of these appliances inspected had this removable but not adjustable nozzle. We do not carry those in stock now so we could not supply all our customers with the right kind of nozzle in case we were going to change our gas. I have given 41 and 21 per cent, that is 62 per cent, I have accounted for, and 38 per cent are still to be accounted for. They are—these are all plusses, 37 per cent. plus, 41 per cent. plus and 21 per cent. plus. There

are 37 per cent. plus that have adjustable orifices. That is an orifice that is readily adjusted to the various kinds of gas by the turning down or the turning out of the cap over the orifice, over the cock. I do not mean adjust the size of the orifice. It is adjustable to the extent that it allows more of a variation than is with the fixed orifice. Of course, there is a limit, but you can go up and down on it by screwing the cap down or by reversing and screwing it the other way. They are to regulate the quantity of air [fol. 559] entering, more or less, because you let in more or less gas and you have to change the air and they have shutters on them. I have given attention to the amount of illumination that is furnished in our district by our company, by gas. We still have considerable lighting in the older sections of our district. The newer houses, or the houses that are built in the last five or six years, are all mostly equipped for electric illumination. Considerable of the illumination by gas is by mantle burner, by far the greater portion of it. There are some of the hot plates that have no air shutters or means of adjusting them at all.

We do not deal in these appliances that do not have any shutters or do not have any adjustable orifice. When a person buys one of those in a department store or anywhere else, those hot plates are made with different sized orifices for different kinds of gas and all that sort of thing. If I wanted a hot plate, I would get one at the Kings County Lighting Company, that would work out in our territory but I would not be in a position to tell where I could buy one with an adjustable orifice. These districts that I picked out, will be an average for the situation all over the whole territory, I think.

[fol. 560] WILLIAM A. MORRIS

Cross:

I stated we have salesmen on the district, right out to sell apparatus on the district. They are paid commission, on what they sell. It is to their interest to sell the apparatus sold by our company. That is what they are trying to do, sell apparatus that our company is selling, rather than to educate the public into purchasing any kind of gas apparatus. Our troublemen do not sell gas appliances. In

the paper that I am reading the percentages from, I have the cooking appliances grouped, that is ranges, cookers and hot plates. I haven't the percentage of ranges that neither have changeable or adjustable nozzles. Water heaters are grouped with the heaters and radiators, and I cannot give you that. The water heaters, heaters and radiators are grouped in one class. The percentage is 9 per cent. Adjustable, the heating class; 68 per cent. removable orifices and 22 per cent with fixed orifices, none removable. As a rule, these types of apparatus that have neither adjustable or removable orifices are the cheapest kind of equipment. They are more apt to be found in the hot plates and cookers than in the ranges. I am not prepared to answer whether a good many of those are extremely inexpensive. I do not go into the cost of those things because we do not handle them. Our company might make a small profit on [fol. 561] the apparatus they sell. It is a question of accounting. I fix the sale price. I have definite percentage; I add on to the purchase price to arrive at the sales price. I have a maximum or a minimum. It varies somewhat, depending upon the type of appliance and the readiness with which it moves. The minimum is 25 per cent, I add on to the purchase price to arrive at our sale price. The maximum is 55 per cent and that percentage covers our profit and the expense of handling and selling the equipment.

WILLIAM A. MORRIS

Redirect:

With regard to the cooking appliances, I have them separated between ranges, hot plates and cookers. 47 per cent of the ranges have adjustable orifices; 32 per cent have removable orifices; that is, the groups, and 20 per cent have fixed orifices. That is the cooking group ranges and cookers and heaters. I have them separated. I inspect the class of equipment put in to the houses from time to time as the houses are being built up and go into the houses that are going up. I do not go in every house, but I go into a good many of them. I go into some of the apartment houses and look at the ranges. I do not know of any range made today without the nozzle at the present time, but there are some old ones without it in our district. The

[fol. 562] volume of business in selling appliances was somewhat over $300,000 last year of appliance sales, mostly ranges. Our people when they went out, were just trying to sell our appliances; sell the particular ones that we handled. Naturally a salesman would try to sell his own appliances when he is out on commission. The instructions that I give them are to see that the purchasers of appliances buy American Association Gas standard, whether they are our appliances or competitors' appliances. They discourage the use of coal in place of gas. These men that go out are in the promotion department, promoting the sale of appliances and the sale of gas.

WILLIAM A. MORRIS

Cross:

This $300,000 worth of business that the company did last year, about which I have testified, included some few appliances that did not have the adjustable nozzle. I should say they were in stock early in 1923. In other words, the Kings County Lighting company, in purchasing appliances from the manufacturers of appliances, bought some few appliances that had non-adjustable nozzles. In buying [fol. 563] them, it must be assumed that they knew they were buying appliances that had non-adjustable nozzles. I pass on the appliances that are purchased, and I passed on these few appliances that had the non-adjustable nozzle, when the purchase was made.

The W. N. Crane Company sell appliances. I should say it is a large size company. Other appliance manufacturers I know in New York City are: Union Stove Works,—of course, there are a number of manufacturers that have offices here. Crane's ranges are not manufactured in New York City. Stove works of the General Gas Appliance; the Waterman Company. The appliances that had the non-adjustable nozzle did not come from any of those manufacturers that I have named. Those companies I have just named are manufacturing appliances with non-adjustable nozzles now. I don't know as to the Union Stove Works. I know that Crane is manufacturing ranges with or without the adjustable nozzle.

A needle valve is a valve which has a needle which is part of the stem of the valve. By turning it down the

stem protrudes into the orifice and thereby shuts off your gas or turns it down to some extent. That is a fixed orifice; [fol. 564] but the aperture or the orifice would be made smaller by such operation. If a gas was brought down from 600 B. t. u.'s per cubic foot to 537 B. t. u.'s per cubic foot the cap over the stem would be raised on the adjustable orifice, and when the quality was raised from 537 to 600 B. t. u.'s the cap would be screwed down. A needle valve is not intended as an adjustable arrangement for proper adjustment of the burner. That along with the primary air shutter is the process by which we regulate the flow of the gas to the burner, in order to secure efficient adjustment. That is, it could be done to some extent. The needle valve has not been manufactured for several years. I am quite sure about that.

I have been in the business in which I am now engaged for thirty-two years. That is, I have been dealing with gas appliances for 32 years. I have heard the term "spud" used in connection with water heaters or large industrial appliances. When, in the case of the spud, the quality of gas is brought down from a heat content, having 600 B. t. u.'s per cubic foot to that of 537 B. t. u.'s per cubic foot, besides [fol. 565] adjusting the air shutter or primary air, we have to make an adjustment on the spud, and when this reduction in quality that I have described goes in, we ream out a little larger hole at the end of the spud. And when we increase the quality or raise the quality of the gas from 537 B. t. u.'s to 600 B. t. u.'s, we can put another spud on, with a smaller hole, in some appliances. Assuming that we have appliances in which we use the spud as a nozzle; it then can be changed. I doubt whether it could be done in a few seconds; that is, screwing off one spud and putting on the other one. It necessitates taking the top burners off, that is, taking off the top burners and unfastening, if necessary—in an oven you would unfasten the cocks on the oven itself. Some could be reached through the removal of the top burners and placing the hand in through the firebox. In others it would necessitate removing the cocks. I would not characterize the labor of doing that as insuperable or something beyond the reach of practicability.

Since I have been connected with the Kings County Lighting Company, I have gone out to make other investigations of the kind I described in my direct testimony in behalf of

the Kings County Lighting Company. On my personal investigations I did not get up a classification similar to that which I got up and about which I testified on my direct examination. I have from time to time made analyses of the [fol. 566] calls made by different men; more for my own information in the conduct of the department than as a report to the company. I reported to the officers of the Kings County Lighting Company my conclusions as to the analysis of the investigations. I reported the analysis that I made, with my recommendations for changes in the conduct of the department. The company consented to my putting on additional men to take care of complaints of this type. I have talked with users of this non-adjustable nozzle appliance and explained to them the effect of using those things, and have warned them against purchasing appliances of this kind. We have, in the past through advertising, endeavored to explain to our consumers the effects of using appliances of this kind. I do not know how many open flame burners there are in the district of the Kings County Lighting Company in the 30th Ward of the Borough of Brooklyn. In a substantial number of the cases of the Kings County Lighting Company where open flame burners have been in use, consumers have changed that open flame burner into what we call a mantle burner. You can buy mantle burners of [fol. 567] proper sizes for various qualities of gas. That is you can buy mantle burners to burn with gas having 537 B. t. u. content, and also 600 B. t. u.'s., and also 650 B. t. u.'s, but not efficiently. If I remember correctly, mantle burners have been in use since about 1892. In order to properly burn 650 B. t. u. gas efficiently, you would not have to have a larger mantle than the one that you use in burning 537 B. t. u. gas. Mantles are standard for the burners they are made for. The size of mantles do not vary.

In my early examination I spoke about a cap on certain valves. That is not a needle valve.

This thirty-two years' experience I have had includes that portion of the time I have been with the Kings County Lighting Company. I was with the Milwaukee Gas Company and the Wilmington Gas Company, Wilmington, Delaware, before that. I was in charge of the sales of appliances and sales of gas in both of those places; ran similar departments there, and looked after the district so far as complaints were made.

[fol. 568] DR. JOHN F. WING

Direct:

I am employed by the Boston Consolidated Gas Company and they rate me Engineer of Research. I came with the company as chemist, and then was afterwards in the manufacturing department. I have been with the Boston Company for thirty-six years, and as chemist, about four years. As chemist I was at the works inspecting and controlling manufacture, the rest of it the manufacturing department as assistant superintendent and superintendent. I have been in this research department since about the 1st of 1920. I live in Boston, and my whole professional life has been spent with the Boston Company, in the gas business. Earlier I was instructing in chemistry in Tufts College and in Harvard College, as assistant professor. I took my degree of Doctor of Philosophy in a German university, in 1884.

I have given attention to ways and means of making gas and different kinds of gas. We have manufactured all gas in a small way as an enricher for coal-gas, and manufactured coal gas for a long time, and in the earlier days of water gas manufacture we took that up and have plants which make nothing else. I have been in charge of nearly all that they ever had at one time or another. The company makes water gas now. They purchase coke oven gas for part of their output. Last year their output was about nine billion cubic feet. It is between 30 and 35 per cent. coal gas purchased. The fixed standard is a 528 B. t. u., measured at [fol. 569] testing stations specifically at least one mile from the works. The Boston Consolidated does not make the coal gas. Officially I have nothing to do with the making of coal gas, and I am not active now with the making of the water gas, except as consultant and running experiments or something of that kind. I did make the water gas though, and was in charge of making the water gas for a series of years. I am not sure that I can answer whether there is a minimum or a maximum for 528 B. t. u., or what the range is I am allowed, accurately, but it is a 528 B. t. u. standard. We did not have different standards in prior years on the B. t. u. basis. During an experimental period when they were deciding whether to go to the B. t. u. basis, it was left

to the discretion of the companies what gas they should put out, and the gas Commission recommended that they should not get below 500 B. t. u.'s during the eighteen months that it was under observation. It began in July, 1916, and there was an eighteen months' experimental period. It was to decide whether or not the company should make B. t. u. gas. Before that they were sending out gas on a candle-power basis, and the standard for that was 16 candles, and beginning in 1916 the question was up as to whether we would go to a B. t. u. standard. We had eighteen months experimentation to determine what the standard would be in B. t. u.'s. The 528 was fixed by the Commission in Massachusetts after this eighteen months' experimentation by the various companies, throughout the state. And this 528 is [fol. 570] now uniform throughout the state. Out of the sixty companies, large and small, they selected, I think it was, eighteen to make gas and send it out under their own discretion. The State Gas Inspector observed it from time to time as to the quality and satisfaction. Others were kept on candle power basis. The companies themselves made no experiments, they ran as they chose for quality, and they were expected to send out the gas in good faith, and, as I mentioned, it was suggested that they do not go below 500. I was in contact with our company's operations at that time. We were a free lance company—and discarded the candle-power basis in July, 1916. A few of the more important companies that did likewise included all the larger companies in the State, Cambridge, our own company and so forth. We were free to make any kind of B. t. u. gas we wanted to above 500. In regard to that, at the first of that period we were sending out about 570 B. t. u.'s. That 570 B. t. u.'s, was the B. t. u. content of the 16-candle-power gas we were sending out before that. That is what 16 candle-power averaged up, about 570, with us, with our mixer, and that is what we found ourselves using at the inception of this period. From that point we in the course of six months sent it out so that it was down to about 540 to 550, and during the period we never on the average sent out more than that, for the rest of the eighteen months. We sent out [fol. 571] gas—I suppose there were no tests below 540. That is for the last year of the experimental period. At the time this liberty was given us we reduced it 25 to 40 B.

t. u.'s., and then kept it constant, and for the last year we sent it out at about 540. In 1916 and after I was in an explosive plant that our people ran. In 1915 we began washing the gas to extract toluol, benzol, and went into the munition business and made explosives. I was detached into that business, vice-president of the company that we formed, and not actively at the works, I mean to say. I was consulted as to what would have to be done in order to drop it from 570 to 540. I kept in close touch with it. A change in B. t. u.'s is effected in the manufacturing end, in the following manner. In the case of making water gas it consists of putting in less enriching oil to a thousand feet of manufactured gas, by making a larger proportion of the blue hydrogen gas in the generators. The Commission adopted the order after this eighteen months' period was over that I spoke of, and our company then went to the 528; that was our minimum standard. We may furnish it higher than that, if we want to. We send out gas from the plant to insure its testing up to standard two or three per cent. richer than the fixed standard, but that amounts to 538, and some years it has averaged 542 or 543, and then some of the gas [fol. 572] goes six miles, some ten and twelve miles.

In order to get a particular standard, we use a given amount of oil in the gas so that we will get that standard. And if we change the standard, we put in more oil or less as the case may be. We also adjust the operating conditions of heats, steaming and running the machinery, to compensate for more oil. We have given attention to the variation in quantities of oil that would be required to make different quantities of gas, and most of that information was acquired under the candle-power standard. I have visited plaintiff's plant, and have been informed as to the kind and quality of gas it is making. I have seen plaintiff's exhibit and have been told how much oil they used last year and how much oil per unit. I have made an estimate of how those materials would vary if plaintiff were making a 650 B. t. u. gas instead of what they were making. I was told that they are operating to make gas to some degree higher than the standard required, 537, so it would insure a test of 537 at the testing station. As to the production of heat units from oil and from blue gas, taking the factors that are found from experience, it is something like 100,000

[fol. 573] B. t. u. available for each gallon of oil, and 300 B. t. u. for each foot of blue gas. And taking the conventional figures as coefficients which are usually used in computation, it would take more than 4-1/2 gallons of oil per thousand feet to get 650 B. t. u. gas at the works. Taking a higher coefficient, both for oil and for blue gas, that is practically attained—by us, anyway, that is, 100,000 B. t. u. per gallon of oil, and blue gas at 310 B. t. u., which assumes a generator gas with less than 4 per cent. of inerts in it, you would obtain gas of 667 B. t. u. at the works, and those are impracticable, optimistic figures. And, considering those things, I think it is impossible to make it with 4-1/2 gallons of oil, considering the test made right at the works. There are reasons for its being less at the testing station. I do not know if that is part of the question. Such gas tested at the works is 50 per cent. richer in oil vapors than that they are now manufacturing, and 50 per cent. more chance for its condensing beyond. Besides that, the gas oil goes out from the plant under compression, which induces a condensation on that account. I base this partly on figures that they have shown to me for their efficiency of operation, and I may say that it is better than we ourselves experience, as they get more out of the oil and operate, on [fol. 574] the whole, with a great deal of efficiency. I did not figure how much oil plaintiff company would have to use to get a 650 gas out at the testing station just beyond the holder, just on the outlet side of the holder. I say with certainty that 4-1/2 gallons would not be enough, and the question of the losses on the way is something—well, I might say I can estimate. That would be something they could estimate from the losses sustained now with the present kind of gas. I know, in our own experience making a comparatively leaner gas we raised the quality of the gas two or three per cent. above the standard to insure its having that quality at the testing stations. For 4-1/2 gallons of oil, I calculated it would produce at the works 637 B. t. u. gas, and 15/100ths of a gallon more is about three per cent.—that would just about make 650 B. t. u. gas, at the works, on the basis of these coefficients. I am relying on my own knowledge and experience that the coefficients are accurate. This is also assuming the present quality of gas oil that they used in the last year. From the results that

they got last year, that is, the quantity they used per thousand cubic feet, it must have been good grade oil. And if that oil was of an inferior quality, how much higher it might [fol. 575] go beyond this 4.65 that I mentioned to make it at the works, I could not say. These figures that I have given of 4.65 would only prevail in case plaintiff company had equally as good oil. There is theoretically a reduction of the generator fuel which makes the blue gas. If a large volume of oil is used, 4-1/2 gallons or more, the percentage of oil gas in the finished gas would be over 30 per cent. instead of 20 per cent. I presume they have now—I have not looked into that. That would be 100 feet more oil gas and the blue gas would be reduced in that proportion. Therefore, theoretically, you would use less solid fuel in the generators. In the case of the richer gas, seventy per cent. would be made in the generator, and in the case of the leaner gas 80 per cent. as at present. That is more or less approximate. I have no information about that. Then there is a question of treating the larger quantity of oil in the cracking chambers, which requires additional heat from burning solid fuel in the generator. Adding, as in this case, more than 50 per cent. of oil to a thousand feet increases the duty demanded of the fixing chambers 50 per cent., and that work is all heat robbing—that is, robbing from the set so more fuel has to be used in the generator just on that account. The additional fuel would not compensate for the fuel saved, but the theoretical saving I mentioned at first [fol. 576] is not wholly attained. They used this last year the same quantity of generator fuel, practically, as we did for the same quality of gas. When we made richer gas we used—I do not remember just now where I got it from—they used this last year for generator fuel 32 pounds. We used for some quality of gas about 33 or 37. That figure is not right. They used 34 pounds of generator fuel per year, per thousand. When I say "they," I refer to the Kings County Lighting Company. They make less blue gas from the generator—and perhaps I might explain in this case that of all the generator fuel used, where it is around 32 or 34 pounds approximately, practically half of it is converted into the blue gas which is sent out, and about half of it is used for keeping up the heat in the set. In the intermittent blowing a certain amount of heat has to be put

into the set so it would decompose the steam, and that is the use of the fuel, practically 50 per cent. each way. If they have to make less blue gas, less pounds of fuel are used in the generators for gas-making, but more fuel is used for keeping up the heat. That is, it is on the principle that they have to keep the generators up to what is called heat efficiency in order to produce the best results, and also in the cracking chambers. You cannot make gas with a cold [fol. 577] generator very well; you have to bring it up to a certain temperature before it becomes efficient as a gas making machine and during the cycle, the steam robs it of heat; also during the cycle the cracking of the oil robs it of heat. There is a saving on that account of fuel for gas making but a little larger use for keeping up the heat. There would be a balance of saving. I have guessed at how much that would be in pounds. You cannot tell what anybody else will do unless you compare figures in the same conditions. When we were making richer gas from 620 down, we used more fuel in the generator than we are using now. We cannot say altogether that it is a more efficient operation now; but that is the tendency. I would expect a little saving of that generator fuel, but just how much I could not tell. If 32 pounds was the figure to start from, it might be one or two pounds less. In our own experience, I may say, where we changed the quality within a couple of years, it was just that way. When we did not have to heat so high, the fuel figures were quite constant for generator fuel. I would not expect there would be a saving of more than 1.98 pounds. I may say in our last year's operation we used less coke per thousand than the Kings County did by almost—when I say "we" I mean the Boston Gas Company—we used less coke, but more oil—25/100 of a gallon more of oil. This is a question of compensating oil for coke as a raw material. What we made was 539 as a test but we used more oil than plaintiff did by a quarter of a gallon, and less fuel by 1.8 pounds. We used coke fuel. Even [fol. 578] when you are making the same kind of gas you cannot anticipate so well how it is going to come out, because the blue gas that is made is better or poorer depending upon the operation, but they do balance that way, because that is merely a question of conservation of energy. Ours balanced differently last year than plaintiff company's

did. We got more oil, less fuel. We were making about the same kind of gas but the quantity of oil might be still different. We might have a different quality of oil. The oil we used was mostly from the refinery our people run. I happen to know that it did not crack so efficiently as regular distillate gas oil. I have already said, that the quantity plaintiff used here, showed efficient operation. The difference per pound of fuel does not compensate for the same amount of oil. In making water gas, large quantities of steam are used. You have got to make a lot of steam. Making the gas eats up a lot of steam and you have to generate a lot of steam. You use quite a lot of boiler fuel right in the set itself you use the amount of 30 pounds of steam per thousand. In one plant they might admit more steam and in another less. There could not be ten per cent. less, but often they put in twenty per cent more. There is less steam used in making a higher B. t. u. gas. That is due to the fact that less blue gas is made and more oil gas and therefore you would expect a saving in boiler fuel, and a saving in water, too, if we had to buy the water to turn it into steam.

Q. We want to find out how much more our expenses [fol. 579] would be in case we had to make 650 B. t. u. gas?

A. Well, I will say it is less, but it is almost insignificant, for their steam expense.

Q. The reduction in steam expense would be insignificant, you say?

A. Yes.

Q. So small that you could not figure on it?

A. Well, the usual figure is 12 or 13 pounds of boiler fuel for a thousand feet, and you could not put your finger on a pound's difference on account of the quality of the gas, I don't believe.

Q. Which is the easier made or the more conveniently handled in the generators for the company—a 650 B. t. u. gas, a high B. t. u. gas or a low B. t. u. gas? Is there anything in the operations that you can say will tend to increase the merits or demerits of either a gas with respect to the manufacturing end of it? You have told us about the materials now, Doctor; you have told us about the alterations in materials, the variance in materials. Are there any difficulties in the making of one over the other? Can

you go in and make one just as well as the other, provided you have got the materials there, or do you have a more delicate operation or what?

A. The low B. t. u. gas is certainly easier to make because the difficulties of the operation is keeping to any constant standard or in the enriching of it. There are [fol. 580] fuel manufacturing difficulties in handling any quantity of oil when it is increased significantly, and here it is expected to be increased 50 per cent. The difficulties are cumulative in attempting to crack a large quantity more of oil in the same space, in the same apparatus and at the same time. One of the difficulties is, as I suggested, about the generator fuel not being so much less because the fixing chambers have to do so much work that the temperature has to be kept up by a certain amount of fuel—a certain amount more. The large quantity of oil that goes in there does not all crack to gas. Part of it goes to condensible vapors, part of it goes to carbon, which is not volatile or liquid, and stays there. That begins to plug up the machines if thermal balance is not kept pretty nearly.

Q. Well, the thermal balance is more easily kept correct with the lower B. t. u. gas?

A. Yes. That is the whole question. Well, for illustration—in making a run, different cycles would take in different quantities of oil. If they were previously running on a 7 minute cycle, say, the machine might be taking in 50 or 60 gallons of oil in four minutes. To make a rich gas it would be 50 per cent more—80 or 90 gallons in four minutes; and that is where the difference in the effect on the machine and the delicacy of the operation consists.

You would not necessarily have to increase the length of the run when you use the larger quantity of oil. To make the same gas in an hour or a day there are so many running [fol. 581] minutes. If you make the same amount of gas in the same machine, the same number of minutes for introducing the oil is all there is. If it is half the time, it is only half of the time. The only escape from that is by reducing the capacity of the machine so as to introduce the oil at the same rate when making rich gas as when making lean gas. That is on the cracking chambers; it is like an automobile carburetor. As to how many minutes a cycle covers usually—that is always decided locally. It is prac-

tically 40 per cent blowing time and 60 per cent steaming time, more or less. If you lengthen the cycle from a 5-minute cycle to a 10-minute cycle, you only make half as many turns in an hour or a day. You cannot have any more minutes for oil introducing. To get the best results out of the larger quantity of oil, you would want to introduce it at the same rate at which you introduced the lesser quantity of oil. I may say that since the standard has been lowered in many places, all machines are taking advantage of that and are obtaining much larger capacities from sets just on account of the handling of the oil. They can make more thousands of feet per hour per day because they are using three gallons per thousand instead of four. I think plaintiff's plant down there can turn out more—it has got a larger capacity of 537 B. t. u. gas than it has of 650 B. t. u. gas, 650 on account of the oil handling proposition.

[fol. 582] I am talking now about the general experience in making water gas. As far as I know or have heard, that particular machine is generating as much as any you hear of. In making 650 B. t. u. gas the operating capacity of those machines would inevitably be reduced. The basis might be the quantity of oil we could handle in a day. You might do better than that. That is, if you were making a rich gas with more oil, you might handle a little more oil than that proportion. That is what I mean. Not strictly in proportion to the oil used. This oil would be practically 50 per cent more thousand cubic feet.

There is a residual from the making of gas—water gas tar. That depends, for one thing, very largely upon the quantity of oil that is used in making the gas. The absolute quantity certainly depends on it, and if you increased the quantity of oil you have put in your gas in order to make a richer gas, you would naturally expect a greater residual. I have not set down any figures on that but if the oil went in at the same time, the absolute volume and absolute percentage would be largely increased if it went in. I mean if you were making gas at the same time, but added 50 per cent more oil. It would be largely increased. If you were mak-[fol. 583] ing gas slower and with a large quantity of oil per thousand feet, it would be considerably increased. They have in this exhibit a very small recovery of tar—all outside of my experience anyway. It is five or six per cent of

volume of the oil. I do not know how much they are recovering at all of my own knowledge. The figures were given me. Five per cent is exceptionally low. It is outside of my experience with gas oil. When we were using naptha years ago, when it was obtainable, we got around that figure. The company can't help making this water gas tar and therefore a company that has a small amount of it is approaching the desired position. You would have an increased residual if you were using more oil, naturally, for the reasons I have given. In the company's present operations it is using 2.83 gallons per thousand cubic feet made. Suppose it had to use 4.6 gallons per thousand cubic feet for 650 B. t. u. gas; I don't know any reason why they should not make as much tar as anybody else, and that would be more than three times the figure that is given for last year's result. The tar produced would be 15 to 18 per cent on the amount of oil under this new process. It would be 16 or 18 per cent on the amount of oil, in volume. That is the usual figure for production of water gas tar. That percentage does not increase when we have to use a larger quantity of oil in order to make a high B. t. u. gas. I cannot say that they do go together and it is always there a question of efficiency cracking, that is, cracking at the right [fol. 584] temperature. We cannot crack it as well when we are putting in so much oil. The percentage of tar ought to increase unless you take that other factor of time—make less capacity. If we do not sacrifice capacity, we will have a larger percentage of tar residual in making 650 B. t. u gas than we had before. In other words, less of our oil will gasify. That is the tendency, but it is substantially true that if we sacrifice that capacity and put in this oil at the same rate that we put in when we were making the other gas, we would expect the percentage of residual to be the same, that is, the percentage recovered from the oil, ever it might be. These figures are so extraordinary, I would say anyway you would get more tar than is given. I would expect they would obtain what other manufacturers do—15 to 18 per cent of tar. That amount of tar that we recover is somewhat dependent upon the quality of oil we are using. Assuming now that your figures are right here as to the low recovery of tar and the low quantity of oil used per thousand cubic feet of gas made, the first thing

that is impressive is that the reason for the comparatively low use of oil is that they are converting it into gas and not into tar. In making the other gas it clogs up, somewhat. Carbon gets on the apparatus and we have to make repairs, that is, the checker brick has got to be taken out, and new checker brick put in. This would have to be done more frequently with a greater quantity of oil. If we were making 650 B. t. u. gas we would find repair labor and repair material at the works amounting to more than we would now and that has been our general experience. It is not as easy [fol. 585] to make a uniform quality of this 650 B. t. u. gas as it is of the other. The manufacturing engineer would have a harder job on his hands, if he were trying to make a uniform 650 gas than if he were trying to make a uniform 540 gas. Briefly you have the high figure there for the standard, and if the inevitable and unavoidable variation is two per cent, it is a larger figure than it is if you have a basis of 500. That is the most obvious reason. I also said that the enriching process is the difficult process and the process in which more technique is required and the more imperfect results are obtained. In the purifying itself, there is not necessarily any difficulty. As far as what is understood by purifying—sulphur purification, the largest effort would have to be put into the condensing—scrubbing. Such a gas would have to be more carefully condensed and scrubbed, or, if it was not done on the works, it would have to be done in the mains and services. The larger proportion of oil used, making a larger proportion of vapors going with the gas with the smaller percentage of carrier, is more likely to be over-saturated. It would require more delicate handling; for all I observed there, it did not require more apparatus.

Take the matter of distribution and utilization of these different gases; there are differences between them. As I have intimated earlier, the gas that is enriched to a great deal higher degree is less constant and gives more trouble from condensation when sent out from the works to the mains under pressure and into the cold ground and then into [fol. 586] the services and house piping. Condensation is brought about by reduction in temperature. As it goes along, the gas gets colder, either rich or lean gas would carry the same amount of water vapor, but it also carries,

in the case of the rich gas, more condensible hydro-carbon vapors that deposit as tar or nap-thalene. As they go out from the works, they are suspended in the gas as vapor. It is carried right along with the gas and if the gas were burned right there, you would burn those up. But as the gas goes along in the pipes and gets colder, those drop out of the gas at the bottom of the pipes, anywhere it has time and low temperature and those things will run into our drip boxes. Some will stay in the bottom of the pipe. The drip boxes need cleaning more frequently but I do not know that that would be significant. The result of it all is that it makes it necessary at the works to handle a larger quantity of oil. The temperature of the fixing chambers would be raised to handle more oil in the same comparable period. That means the manufacture of more nap-thalene, which subsequently has got to drop out, either in the works or in the distribution. That is one of the difficulties that you would encounter besides the fluid tar. It is desirable to have them drop out in the works where they are taken care of. It is one of the sources of the nap-thalene troubles in the services. If it stays in, it enriches the gas. When [fol. 587] they drop out on the way it has no significant effect in B. t. u. It would in candle power perhaps. All that drops out denudes it and affects the B. t. u. quality. How important an element that is in the distribution of this gas is hard to fix. It is not a significantly large percentage 1, 2, 3 per cent. maybe, inevitably some. I know when we were making richer gas than now, we found generally two or three per cent loss in B. t. u. That is, during the testing period mentioned of 18 months; that is just aside. It is not comparable conditions. We sent it out under holder pressure, and not under compression. The loss now with the leaner gas does not average one per cent with our company. I may say in the case of the company I did mention that we purchased and received at the largest plant 35 per cent or so of coal gas, which acts with us as a carrier of the oil in the water gas. In my other answer I was speaking of these conditions here in Brooklyn for two or three per cent. when I mentioned that. That is, the dropping of these things would amount to a reduction of two or three per cent in the B. t. u's. To have a fixed standard at the testing station the standard would necessarily be

higher at the works. I never thought it was as much as five per cent. To afford such a loss it must go out very warm and coldly conducted. In order to have 650 B. t. u's at the testing station, I figure fifteen to twenty B. t. u's [fol. 588] higher. That is consistent with what I said—two or three per cent. When I spoke of this 2 to 3 per cent of drop in B. t. u.'s between plaintiff's works and holder station where the gas is tested I don't know that I can say exactly that I meant that. Wherever the testing station is—if it is a mile or more and cold passage—cold conveyor, anyway, I was referring to the testing station. From the testing station out, suppose they run three miles out on that to the customer, there would be a further condensation and that would affect the B. t. u. quality of the gas to a certain unfavorable extent, bearing in mind that what does condense in any part of its passage are the richer constituents. As condensation takes place the B. t. u. content drops. Reference was made to the fact that plaintiff company's pipes were underground. The holder is exposed to the elements that is, subject to every variation of temperature that there is in the territory. Condensations would be found there in substantial quantities, and these ingredients are deposited there. That condensation only takes place when the temperature goes down and when the temperature goes up, as it does out there, it picks up the more volatile constituents like nap-thalene and lighter oils and enriches the gas. Temperature of the gas is affected while it is running in the pipes in the ground. The ground temperature is always lower than the condensation point in the works. The gas in the holder is warmer in summer and colder in winter. Whether the gas in the holder is very much colder in the [fol. 589] wintertime than the gas in the mains, but I think there are so many ramifications to it, that it might or might not be colder, that is, if you have a temperature in the air of 30 degrees Fahrenheit, you certainly have a warmer temperature in the main at that time. I only speak generally. I do not know this particular case. Starting from the works, it would be rather below 60 degrees, in either summer or winter, any time; with spring coming, it is below 60; in winter it is lower. It is down sometimes to pretty near 32 when it gets down to the mains but that is all incidental. I mean the temperature of the mains is mostly lower than at

the holder station at the works. The gas usually starts from the works higher than 60 degrees and if there is a swift and continuous flow, even if the ground is frosty, the temperature would not get down to frost unless the flow ceased, then your vapor would freeze and the pipe becomes cold. As to the other gas, the lower B. t. u. gas of 537 or 540, the aqueous condensation is practically the same. The condensation of hydrocarbons, oils is less. The relative percentage of loss in B. t. u.'s is a great deal less than in the case of the leaner gas. As to the range or variation in B. t. u. starting with 540 B. t. u. gas, we will say, from the works with a temperature of 60 or 80 whatever it is three miles out, comparing my own experience, if the same gas were tested, I should think one or two per cent in B. t. u.'s would be the maximum variation and that is accounted for because there is less vapor in there to drop out in the process of condensation.

[fol. 590] Kings County Lighting Company

Brooklyn, N. Y., March 25, 1924.

DR. JOHN F. WING

Direct:

Referring to the arrangement made for the utilization of the different grades of gas meaning those of higher or lower heating value, the gases of higher heating value must have more air mixed with them to make complete or even satisfactory combustion, and the arrangements in the burners are made for that purpose, to admit more air for a richer gas and less air for a leaner gas. The burners are practically of a Bunsen type, and the flow of the gas induces a supply of primary air for preliminary mixture. For a lean gas the air openings are restricted, and for a richer gas the openings are made wider, to permit more air to enter. That is what has been spoken of here as a shutter. The shutter regulates the proportion of air to the gas and the flow of the gas induces a flow of the air in to mix. The difference in the construction of the burner with reference to the size of the orifice, in different qualities of gas is the difference in proportion of the openings of the gas orifice to the air orifice. There are all kinds of burners and attach-

ments. It is done in different ways. There are some burners with fixed orifice unchangeable, and fixed air supplies. When I speak of orifices here, I mean the gas orifices. As to whether it is necessary to make an alteration in these orifices in changing from a richer to a leaner gas, or vice versa, if there is any considerable difference in the heat-
[fol. 591] ing value, they should be changed. I would consider 5 per cent, 10 per cent was a considerable difference measured in B. t. u's. 5 per cent makes a very considerable difference in the appearance of a flame, even without a change, the gas will light, and burn, and produce heat. When you come to the limit of the practical or efficient range, the gas, if richer, begins to smoke, or if leaner, makes too intense, too abundant an air mixture, and it is likely to flash back. That is the flame goes from the outlet nozzle of the burner to the gas orifice, and then burns incompletely, with insufficient mixture of air. If the quality of the gas is richer than the burner is intended to accommodate, it smokes. The air required for burning the gas is very closely in proportion to the heating value of the gas, and, if the burner, for instance, is adjusted for one fixed standard and the gas is made considerably richer, the air supply does not change correspondingly. Then they have a comparatively poor flame, smoky, if the gas is richer. When a flame smokes, it indicates that you are not burning up the gas entirely, not getting the use out of it that you are entitled to. In a Bunsen burner the effectiveness depends, or in any burner the effectiveness depends upon mixing air fairly with the gas to burn it before it reaches some point where it is too cool to burn. In a Bunsen Burner that is accomplished by making a preliminary mixture inside of the burner tube or cylinder. It is accentuated in the case of natural gas, where it is very hard indeed to get air enough in to make any kind of a short flame.

[fol. 592] Q. Assuming that the appliances of the consumers of the Kings County Lighting Company, numbering about 50,000 customers, had been regulated or adjusted to accommodate a supply of gas ranging from 535, we will say, to 540 British thermal units per cubic foot, is it practicable to supply to those consumers gas of a 650 British thermal unit per cubic foot for the same appliances, either with or

without adjusting them, or if not, why not? Will you please give the details?

A. The common burners, to work efficiently, should have a rather constant mixture of primary air with the gas in the burner, constant in the sense that the mixed gases, that is the mixed air and gas, should have about a certain heating value, say about 170 B. t. u.'s in the mixture of air and gas inside of the burner. At that rate it is found in practice that almost all gases give the most efficient results and satisfactory performance. When the richer gas is supplied to the gas orifice, it takes in my induction, if no other conditions is changed, the same amount of air. That makes a considerably richer mixture of primary air and gas in the burner, richer in *or* gas, and the gas will burn smokily and the heating value of the gas is changed up. You have that phenomenon first; then if the gas is richer and richer, you get to a point where it smokes and smokes badly. It does that in the case where the mixture of air and gas inside the burner goes from 170, with the most efficiency, up to 200 and 250. If you start from the same most efficient mixture, and turn on gas that is leaner, you will have a mixture of [fol. 593] primary air in the burner which will burn so intensely that it will flash back and then burn incompletely in the burner, with the products of incomplete combustion, which are offensive and poisonous. Without changing these burners, assuming that they are fixed up so that they burn pretty well 537 or 540 gas, without changing those and putting in a 650 B. t. u. gas, the smoke would form right off, if it is used as a burner on the range, and the smoke would soon spread all around a kettle of water, the secondary air would not approach the gas to finish the combustion. I do not know that I need to go into details very much. I presume everybody knows what the range burner looks like. When it is burning properly, it has a bright, pale, blue flame, no sign of yellow. As soon as the air mixture is insufficient, the yellow begins to appear and the flame lengthens and laps all over the vessel and fills the whole area under a vessel so that the secondary air cannot approach and mix with it, and then goes up by the kettle and goes off partially unconsumed and the person that is running the range is not highly pleased with its condition. It is very objectionable, and a person is justified in making

a very loud complaint about it. That is the cooking end of it on the range I speak about.

It would be a first rate condition for lighting to have a rich gas with the old style open burners. If those are made properly they make a bright flame and use a good deal of gas. But the modern way of providing gas illumination is by mantles, and smoking is a very bad thing, and the smoky [fol. 594] carbon in suspension is quickly dropped into the meshes of the mantle. It is commonly known that it may go so far as to deposit enough carbon to choke up the top of the mantle stocking, so-called. There is a little hole at the top of those mantles where the secondary burning air goes, passes by. If that is stopped, such air as would go through there is prevented from going in there, the carbon deposits choke that, and you have incomplete combustion and poor light. There is not necessarily a permanent injury to the mantle, if it can be carefully burned off. It is not very practicable to do that, because it would take a long time. It does tend to shorten the life of the mantle. It makes, for one thing, a weight of carbon on the sides of the mantle.

I am familiar with the water heaters that they have. A change in the quality of gas would have a tendency to affect the efficiency of those instruments. In the same manner and for the same reasons, the combustion there takes place in a comparatively confined space. If the flame becomes large by reason of lack of mixture of primary air, secondary air cannot mix with it for complete combustion and a yellow flame appears and carbon is precipitated on any metallic surface, any surface which has cold water inside of it. That may proceed to any degree in depositing carbon. I will explain what I mean by primary air and a secondary air. The Bunsen burner is formed by a jet of gas flowing inside a cylinder considerably larger, and this cylinder has air openings down near where the gas comes [fol. 595] in. The current of gas flowing in draws air in those ports, and it is just the same thing in the burners on the kitchen range, where they have shutters. The current of gas flows with considerable velocity through the aperture and makes the mixture. The air that goes inside the cylinder is called primary air, and supposing the mixing chamber can be any length from a few inches to several

inches, the air and the gas mix to the extent that they come in. Then at the end of the Bunsen burner it is lighted. The secondary air from the surrounding area finishes the combustion. For an ordinary gas, the gas must take in something like two or two and one half times its volume of air, of primary air. Then it takes the other proportion, which may be as much more, say 50 per cent for primary air and 50 per cent for secondary air, where the burner is lighted. The same action takes place in a Welsbach mantle burner. They all have openings underneath and, if the mantle itself were taken off, you have a simple tube or Bunsen burner which burns with a long blue flame. Then around the mantle the secondary air comes in and completes the combustion which must be completed effectively or the mantle will blacken. That stops the pores and stops the draft progressively, and those pores being stopped up, spoil the illumination and burn up the mantle. This primary air that I speak about is taken into the chamber where the gas is, and it makes the primary mixture with oxygen, by diluting it, and then the gas comes out where the free oxygen is and is lighted, it is that gas which is combined with the free oxygen in the air. There is come [fol. 596] free oxygen in there, because you have already diluted it. You would get an explosion. You don't have to have two volumes of air mixed with gas to have an explosion. In burners used for intensive heating at high temperatures, primary air is pumped in by pressure and nearly up to the amount for complete combustion. For metal treating purposes, for obtaining high temperatures, instead of relying on the induction of the air by the velocity of the gas, air is actually pumped into the mixing chamber. Where two volumes of air would suffice for an ordinary air burner, the proportion would be up to four volumes or more.

I mentioned the products of incomplete combustion—the gases that burn are caburetted hydrogens or carbo-hydrogen compounds. If the hydrogen burns at all, it burns to water. The carburetted hydrogens are of all complexities and, by incomplete combustion, they are broken down nearer to the element carbon. If they are not decomposed to form carbon itself, they form compounds with different proportions or hydrogen and carbon, which may be tars or

oils or gases. I would consider it entirely impracticable to furnish this richer gas in those appliances I first mentioned or suggested without any adjustment, the two gases for example, viz; the gas at 537 or 540 B. T. u's, that has been the experience in a number of cities. It would give unsatisfactory service and for the reasons that I have stated. The gas if distributed without any change at all in the appliances could not be burned without making a [fol. 597] great deal of smoke and without the attendant inconveniences and dangers, unless the flame was kept very low. Then, if the consumer did not know enough to change the mixture himself or the gas company's men did not get around to make the adjustment, it seems to me that it would come to a very impracticable situation. I think the appliances would have to be adjusted before it could be done. It would be a very wrong thing technically to attempt to send 650 B. t. u. gas out without adjusting the burners, all sorts of burners. If they were adjustable, they could get around to do that. If they were not adjustable, they could not do so to their satisfaction or safety even. Besides that, to jump from one of those standards to another could not be done with one adjustment. It has been found in various cities where the standard has been lowered in less proportion that we are talking about now, that they had to make two days of visits to all of the customers, to lower the standard part way and make the adjustment and then lower it again to the final point. It is unavoidable to make adjustments of all those consuming appliances. You could not change them from 540 to 650 all at once. If you changed them for gas half way up, you could not jump the gas to the highest standard and then have the burners work satisfactorily or safely. You could not have on the same district, where the same kind of gas was being supplied, part of the burners adjusted for 650 gas and another part adjusted to burn 540 gas. That is too wide a range. You could not do that. You [fol. 598] could change them from 540 say to 575. The flashing back has to be considered. At the time that is going on, it would have to be all done while you are still making the leaner gas. While you are still making the leaner gas you would change your burners up to as high as you dare. An adjuster can tell by the symptoms the

snapping and the shortness of the flame, and he could set it back again if it was too high. You would have to make just as rich a gas as you could to use in that appliance. It is just the same condition as you have in a kerosene burner giving an area of two inches square and then you desire to have an area of flame three square inches in the same lamp and with the same chimney. You can turn the wick up, burn more oil and have your three inch flame, but you have a long, smoky, impracticable flame. Then an adjustment in that case to get your three inches, the three square inches of illuminating surface that you want, would require that you have a taller chimney to induce more draft, or a wider chimney. An adjustment has certainly got to be made. This is the way it has been done in practice where they were changing from a richer gas to a leaner gas. I don't recall any cases where they have been changing from a leaner to a richer gas in this way. The tendency has been to go to leaner gases. I mean by a richer gas one with a higher B. t. u. content per cubic foot. I don't know any case in the world where the standard is set as high as 650 or is as high as that now. I have seen appliances that are non-adjustable. I know in my own house they have some appliances in which the air ports cannot [fol. 599] be changed. For efficient consumption of gas and utilization of gas, it is desirable to have it as constant in B. t. u. content as possible. The constant heating quality necessarily goes with the leaner gas on account of the difficulties in making and distributing a rich gas which stays constant on account of the high content of condensable vapors, in it, and the higher base that it has to condense from. With a 650 gas you are likely under the best of operations, to have fluctuations in heating quality at times which will carry the gas outside the range of the adjustment of the burner. There are periods in a manufacturing plant when such things become uncontrollable for short intervals of time—not for a day, but for half an hour or an hour, or longer. Gas consuming appliances on the whole, are inclined to render better service with a leaner gas than with a richer gas. In this higher standard that we are contemplating—the heating value derived from the oil is about two-thirds, and if less oil is put in the heating value goes down fast. In the case of our own company, two or

three years ago when we had a storage of gas oil at another place and the river froze up and we could not get it, we had to ask premission from the Public Utilities Commission to send out leaner gas, and we did it with safety because the drop, on the whole, the absolute drop would not be anything like what would happen here. In our case, the oil gas only furnished about fifty-five per cent. of the heating value; so the appliances were all adjusted at a point where leaner gas could be handled.

[fol. 600] Take the ordinary household gas consuming appliances. No matter what kind of gas you use, they ought to be looked at once in a while. They will kind of get a little clogged up and one thing or another and they would naturally require more frequent attention with a 650 gas than with a lower gas. Naturally if you have this smoky condition, carbon will deposit as well on the vessels as around the burner and the holes in the burner. We are all old enough to remember the old open burners with a rich gas that you had a little tuft of carbon on the slot and then instead of their being a big fan-shaped gas flame, you would have one finger sticking out. The tip of the burner gets hot and decomposes the gas, deposits the carbon in a place where it is not hot enough to burn it, just the same as it would do on an iron burner in a range, or in any apparatus where the holes are quite small. It is a frequent phenomenon now that your burners begin to show a smoky tip and the holes have to be reamed out, so it is not a question of air adjustment.

[fol. 601] The Bureau of Standards at Washington, D. C. is one department of the government which investigates technical and scientific matters. It has for a considerable period of time investigated the heating content of various gases and published its statistics regarding its investigations. I regard those statistics as reliable and thoroughly scientific in character and perfectly accurate in every respect, so far as scientific accuracy can be obtained. I do not know Circular No. 32 by the number. If I were reminded of a portion of the text of Circular No. 32 I would recognize whether I had read it or not. Assuming equal efficiency in the adjustment of the appliances, and comparing 600 and 537 B. t. u. gas, in a general way the usefulness of the gas is in direct proportion to the heat content.

[fol. 602] The language of Circular No. 32 as to the usefulness of gas being in simple proportion to its heating content, means that where the appliance or apparatus heated is adjusted with the best efficiency, that it takes less volume of the richer gas. All matter burning in the open air tends to absorb from the air the necessary amount of oxygen to insure the combustion of the matter that is burning. A gas flame on a gas burner of a gas stove is no exception in that respect. I do not think that the Bunsen burner is the most efficient type of burner for burning gas that man has yet invented. The high pressure burner beats it. I mean where there is an effort to pump air in to insure an increased combustion. That principle is not practicable, on gas stove burners. The gas stove burner is, for all practical purposes, identical with a Bunsen burner.

Q. The indication on a Bunsen burner, as well as on [fol. 603] the burner of a gas stove, of perfect combustion of the carbon elements into flame lies in the fact that it burns with a blue flame. There is not a little tip of yellow on a perfect Bunsen flame. That should just disappear. They should aerate in a little beyond that point and there would be no yellow, and in that flame there is no actual section, but distributed points in it. Some are hotter than others. The second section, from the bottom is usually the hottest section of the flame. The vessel that you are using on top of the gas stove is generally higher to give more chance for the secondary air to mix and burn and not only that, but it also has to be set properly in order to insure the least waste of heat possible. What I said about 537 B. t. u. gas burning on the stove and its heat being utilized to bring water to a boil, for instance, that condition would obtain about the same whether it was 650 B. t. u. gas or 537 B. t. u. gas, assuming equal efficiency now in the adjustment of the appliances. The ordinary Bunsen burner used in our chemical laboratory can be adjusted to burn gas having a heat content up to 800 B. t. u.'s per foot gas, and it can be adjusted to burn as low as 450 B. t. u.'s per [fol. 604] cubic foot, or if the gas is learner, it can be adjusted. I would like to qualify my last answer by inquiring what is meant by an ordinary Bunsen burner. In this way, by ordinary Bunsen burner is meant those at hand and available. I think 650 would be about the limit. In a

chemical laboratory, however, they can make them to burn up to 800 or 900. At the bottom where the gas enters the burner we have a little shutter there that we move about and which discloses orifices through which the air goes and those orifices can be made larger or smaller, depending upon the amount of air that we wish to have enter the orifice and the same is true on a gas stove. That is, there is a little slide there that discloses a triangular orifice, and those can be made smaller or larger. That is a matter of a few seconds and those shutters control the introduction of what we call the primary air and beyond those shutters and in a little chamber the gas and the air mingle and in that chamber and through those orifices of the primary air, by reason of some provident dispensation of nature, there is a tendency to be drawn in the necessary amount of air to insure combustion. (A little piece of metal handed to witness.) This is new to me, but I can see that it is meant as a gas control, the gas supply coming in here and passing through, and this cock controls the supply of gas and pressure on the orifice. There is no method here for the air mixture. It was commonly called a gas cock, and this little part here, (shown witness) I call a cap. I do not know the [fol. 605] trade name. I have heard it called a spud and a nozzle. I note that one of those spuds could be taken off very quickly and I observe a little hole here (indicating). Assuming that that cock was on some gas stove in the plaintiff's territory and in use and through some requirement the standard of gas was changed from 537 to 650 B. t. u.'s, it would be necessary to substitute another spud for this with a smaller hole, and that would not take a very long time. That is just a matter of unscrewing this spud and putting another on just like that (illustrating). That is a matter of a short time. There is more to it than just that. The other part of the burner would have to be pulled off to make it approachable, that is, assuming the cock was not accessible. The air chamber would usually run in towards the burner. The air chamber is usually a considerably larger cylinder running right ahead. A simple kind of a thing would be an open ended cylinder like that, pointing right in (illustrating). In order to get at the spud we have to take this air chamber off.

Mr. Hyatt: I have another fixture here that I want to ask him about.

[fol. 606] Mr. Moran: This is worse than the other one?

Mr. Hyatt: Yes.

Mr. Moran: Why don't you mark it for identification.

Mr. Hyatt: All right, I will. This was Defendants' Exhibit 93 in the New York & Queens Case.

(Marked Defendants' Exhibit No. 4 for identification) (another piece of metal handed witness.)

It is a gas cock arranged with a different form of spud or cap for the same purpose of adjusting the burner and that has a nozzle or spud or cap, as you call it, that performs a similar office to the spud in the previous case, just marked for identification. The structure of the so-called spud is different. From my knowledge I cannot say in what respect that particular spud performs its functions any differently from what the spud did in the previous case. It is a new one to me. I don't know what the different holes and grooves are for. It has wider possibilities for adjustment, depending on the varying heat content of gases than the previous spud has; it can be adjusted quite a little before it is necessary to change it for a new one so that upon the movement of that cap up and down away from a little point inside we would control the amount of heat content in the burner on the gas stove. It provides for a variation of the heat. That is, within a little limit, the little orifice or aperature can be extended to a very substantial amount. If the gas is richer, as less is needed, this can be screwed [fol. 607] in so that this comb or what you call the needle fills up more and more of that hole. In other words, it regulates the flow of gas. That has nothing to do with getting in the proportionate mixture of primary air for the primary mixture. In other words, it regulates only the flow of gas and not the flow of air. Friction holds that spur. It is very likely to get out of adjustment. It turns very easily; and if it is plated, it won't rust and stick. The length of time consumed in moving that so-called cap there to do what I said it would do, is only a matter of a few seconds when you can get your fingers on it, if the burner is not covered up by any part of the stove, and if the cock appliances is perfectly accessible, after you get on the premises I do

not know what the common name for this cap is. I never have seen that before. I have seen needle valves in other forms. They perform their office in the same way that this performs its office—a needle valve.

(Marked Defendant's Exhibit No. 5 for identification.)

Taking the conventional way of expressing the constitutents and the usual way of analyzing the gas, the methane in 537 B. t. u. water gas would be about 14 per cent., 30 per cent CO, 4 per cent CO2, and 3 per cent nitrogen. Other gases of what they call the ethylenes are grouped under the [fol. 608] designation of illuminants and are a mixture of an indeterminate number and kinds of gases. All in small percentages. Those gases that I have named constitute the principal gases in illuminating gas of 537 B. t. u.'s manufactured by the water-gas method. In 650 B. t. u. gas we call them by the same terms. The percentage in 650 B. t. u. illuminating gas manufactured by the water gas method, of methane, is not constant; say 17 per cent. 25 per cent CO carbon monoxide; 4 per cent CO2 and 3 per cent nitrogen. The hydrocarbons what are commonly called the illuminants —each one is in a small proportion and together they make, as they are determined, 14 per cent as compared with 8 per cent in the 537 B. t. u. gas and of course, we have hydrogen in both gases. Approximately, taking those figures, the percentage of hydrogen would be the difference—probably 37 per cent 650 B. t. u. gas would have a little less hydrogen, like 35 per cent. For the record I would like to say those are typical figures. Meaning the percentages I have given above are typical figures and not fixed. The relative proportion of the gases derived from the oil is increased, in changing from a 537 B. t. u. gas to a 650 B. t. u. gas. Those gases are all the hydrocarbons mentioned, including the illuminants and marsh gas methane increases in actual proportion. CO does not increase in actual proportion. In CO2 not necessarily any change, and hydrogen decreases. In the rich gas hydrogen is the lightest gas known and it represents 1 in the periodic arrangements of the elements, that is, that is the basis from which all computations with [fol. 609] reference to the specific gravity of elements are made. Hydrogen has a low heat content, considering it by volume; low heat content considering it by density. With

reference to CO that is low considered by volume and *high* by density. Methane is a high heat constituent and supposed to have the highest heat content of any of these gases, both by volume and by density, of those mentioned except the illuminants. The illuminants are those that form that group of various and indeterminate hydrocarbons that contribute to the illuminating value of gas in an open flame. The hydro-carbons gain in volume, gain in heat content in going from 537 B. t. u.'s to 650 B. t. u.'s, practically in proportion to the percentage increase, so there is a change in heat content, in changing from a standard of 537 B. t. u.'s to 650 B. t. u.'s per cubic foot, there is a gain in actual heat content. There is a gain in volume, too, in this respect: Take 1,000 cubic feet of gas and we add one gallon of gas oil to 1,000 cubic feet of gas made on a standard of 537 B. t. u.'s per cubic foot, and we get an additional quanity of gas out of an additional quantity of gas oil used, that would be by volume. In proportion to the additional oil used, broadly, I would say it was approximately 70 to 80 cubic feet per gallon, probably less, but in that direction, 60 to 70.

I have been in the gas business about 36 years. Generally only coal gas was being furnished 36 years ago having a heat content of 600 B. t. u.'s and probably 630 per cubic foot. In my experience of over 36 years, that heat content varied [fol. 610] up to the present time in general gas distribution: some 730 B. t. u.'s per cubic foot that we have made ourselves down to less than 400 in some places in this country. I have made 22 candle power gas. 22 candle power water gas might range from 600 to 620. It might be slightly above 620. I never know it go up to 720. From 1905 down to approximately January 1, 1920, the prevailing standard of gas in the City of New York was 22 candle power. I never investigate that gas to determine its heat content. In order to make 22 candle power gas four gallons to four and one quarter gallons of gas oil per thousand was added to the pure water gas. The Baume gravity of that gas oil was 37 or 38. In my computation involving those figures as to the additional quantity of gas oil and as to the lesser quantity of coal used in making 650 B. t. u. gas as compared with 537 B. t. u. gas, the basis of my determination was based on gas at the works, the outlet, that is, all those figures with reference to the lesser amount of coal and the

additional amount of gas oil were based on the works gas; gas not distributed at all. Oxygen, nitrogen and carbonic oxide that is, CO2 are in illuminating gas that are commonly called the inerts. They are heat deterents, nitrogen is an inert and also heat deterent. Some, but not a large proportion, of condensation takes place in the distributing mains on the way to the consumer's premises. It was greater in the case of the manufacture of 650 B. t. u. gas, and lesser in the [fol. 611] manufacture of 537 B. t. u. gas. Some takes place in the holder before it is ever distributed. A large part of the real loss by condensation takes place in what we call the high pressure mains. The lik-lihood of condensation is greater in any event, whether we use 537 B. t. u. gas or 650 B. t. u. gas, where gas is under compression, as it is in the high pressure mains, than it is in the low pressure mains, that is, a substantial part of the gas elements are lost under the influence of compression. Whether that is substantially a greater percentage than from any other cause is rather indeterminate. Cold pipes in the ground and compression both are very active factors for condensation. The atmosphere at a certain temperature will hold so much moisture. If there is a sudden drop in the temperature, of course naturally there must be a precipitation of moisture, that is, the point of saturation varies as the temperature varies, directly in the same proportion; with respect to illuminating gas, the hydrocarbon saturation point, varies in accordance with the temperature of the gas, so that if a point of saturation in the illuminating gas is at a certain temperature, if the temperature increases there is no precipitation of hydro-carbons, but if the temperature de- [fol. 612] creases, a precipitation of hydro carbons depending upon the condition of the starting point for decreasing the temperature. When the gas is at the works—it is sent out at 60 or 70 or 80 degrees. As soon as it was exposed to the temperature it would tend to take on the temperature of the atmosphere, while it was in the holder. If it was colder there would be precipitation of hydrocarbons while the gas was in the holder and that precipitation would lodge in the bottom of the holder and afterwards be collected or picked up by warm gas. As the temperature went up around the holder, it would absorb some of those hydro-

carbons at the bottom and what was not absorbed would be collected. Then it would be used as fuel by the gas company. On the way to the consumer's premises of course mains are usually put down below the frost line. It is the intention to put them down that far. Some of them are not protected below the frost line. The prime object is to prevent freezing temperature freezing the water in the mains. It is to prevent the water or the moisture which is always in the gas, from being precipitated in the pipes. The oils condense, do not freeze; but that is an insignificant problem in engineering. The important object of getting a main below the frost line is to prevent the aqueous condensation. To a degree there is constant condensation takes place in the main, whether the gas is 537 B. t. u.'s per cubic foot or 600 B. t. u.'s and that rests on the principle of getting rid [fol. 613] of the hydrocarbons where the temperature inside of the main cannot hold that content of hydrocarbons, and of course, that is true maybe to a lesser degree in 537 B. t. u. gas than 650 B. t. u. gas. The gas of lowering heating value stands up better compared with its original value.

Gas mantles come in various sizes. The manufacturer is given to making mantles of various sizes so that the consumer can have a larger or smaller flame for different intensities of illumination or for economical purpose. It isn't true that those mantles are made up of different sizes to take care of varying heat content in the gas. That is not important. In the case of 650 B. t. u.'s per cubic foot, in order to get a proper incandescence of the mantle there is a very slow gradual burning of the mantle constituents that enables you to get the illumination. I would not buy the same sized mantle for 650 B. t. u. gas as I would for 537 B. t. u. gas for the burners I have, because they are not adapted at all by an adjustment to burn 650 B. t. u. gas. I mean now with reference to the air and draft to be supplied. Draft is a question of air supply. With the proper parts, I could get an adequate supply of air in a mantle [fol. 614] where you were burning 650 B. t. u. gas. I said in such burners as I have I could not burn 650 B. t. u. gas. You cannot get a gas mantle that would properly and efficiently burn 650 B. t. u. gas, in the Welsbach store in Bost n. I tried a little while ago to get one of the burners and fixtures such as we used to use earlier when we had richer

gas with the air control and long chimney—long mantle. Whether that is possible elsewhere, I do not know. I don't know whether it would be entirely possible and feasible to purchase a gas mantle that would burn 650 B. t. u. gas in New York City. The manufacturer would have no more difficulty in making gas mantles that would burn 650 B. t. u. gas than burning 537 or 600 B. t. u. gas. They manufactured them for burning 22 candle-power gas. The principal earthen materials that are in mantles are thorium and [fol. 615] cerium oxide. It isn't really a fact that the mantle itself is consumed in furnishing illumination. It is heated to incandescence, that is what furnishes illumination. We have inside the mantle this gas mixed with the primary air or the diluted gas, and that escapes through the meshes in the mantle. It meets the secondary air on the outside of that and causes complete combustion and that creates heat which turns the mantle itself right hot. Just a question of heating it up by heat. If I said heretofore that that mantle was consumed in the process of furnishing illumination, I did not mean so. It is not consumed by any combustion process, but the shattering and bursting. It may break and get more brittle and all that sort of thing; but it is not burned up to furnish anything any more than said. I do not know whether a different mantle is made for higher B. t. u. gas than is made for lower B. t. u. gas or if the construction is any different, either in size or texture. My opinion is that there is no great difference. You can burn them better in a shape which would be adapted to admit more air, but I do not know whether they make them that way. If a man came into a store and said "Now, I want a gas mantle for a 650 B. t. u. gas" suppose he went into a place where they had all kinds of mantle, no one would know what he meant, whether he wanted it for a 650 gas or a 540 gas. He would ask for a burner or fixture that would handle it and he would be rather indifferent about the mantle. The fixture has got to be different because [fol. 616] we have got to have a shutter that will let in the proper amount of primary air for the kind of gas we are using, and a gas orifice to accommodate the kind of air.

In my town, Boston, I tried and could not purchase a Bunsen burner and all that goes with the mantle contrivance, that would efficiently burn a 650 B. t. u. gas. I

know nothing about whether they could be bought in this town at this time. You see, the whole state, and the clients of that store, that agency, never call for them. If the people who supply these things are suppl-ing mantles and burners now for a 540 B. t. u. gas, they should not sell them for use on a 650. If they have got the right kind of a mantle burner now and have been selling the right kind of a mantle burner to consumers 537 gas and the company should go to a 650 B. t. u. gas and they continued to furnish that same kind of a mantle burner, Bunsen burner, and all, it would not work so satisfactorily or efficiently on a 650 gas as the one with the proper chimney and air regulation and that in efficiency would manifest itself by a deposit of carbon on the mantle for one thing and for the second thing [fol. 617] having an improper chimney, the mantle would not fill with white light, and part way up the carbon, from lack of sufficient air, would begin depositing black in a mantle on the sides, then blacken the top, and finally, as it is deposited, would fill the ring opening of the mantle, like the opening of a stocking. The consumers would have to change any mantle burners they had if plaintiff went to 650 gas. Assuming they have now, got the right kind for 537 and 540 they would have to be instructed that when they bought new ones, to insist on getting a different kind. Having the candle power in the Argand burner, the burner with a glass chimney, using 16 candle power gas, a chimney five inches long would make good sharp combustion. With 20 candlepower gas it needed more air and with 22 or 24 candle power it needed more air. We could bring that air in by using a long chimney—8 inch chimney. It is a similar question with a mantle burner to induce the secondary air to come in by drafts in some way. In that inverted mantle there is an air draft that draws the products right up through and around the burner. It goes against the flow; on the inside the flow is downward; but on the outside of the mantle the draft must be upward. It is evident enough when you light it without a mantle on you can follow the course of the flame.

[fol. 618] The mantles were always covered with collodion that was to keep them from being broken while being handled in the trade.

Even if you are burning 537 B. t. u. gas, you still may have a deposition of carbon on the surface of the mantle. I had trouble enough with that, so that, as a matter of fact, you are not always free from deposition of carbon even in the case of 537 B. t. u. gas and of course, it is necessary in the case of a deposition of carbon, to increase the supply of air and burn it off. That is what you have got to do. The cause is usually from the air shutter being plugged up with dust, and it would have to be plugged out and then air would go in so that the same process would have to be gone through in the case of deposition of carbon on the surface of the mantle, giving it more air and burning it off, irrespective of the quality of gas that you were using. All condensation in the mains is collected by the Gas Company at certain periods of time and that is taken back to the works of the company and used. Very often a considerable part of [fol. 619] that deposition of hydrocarbons in the mains is taken up on a rise in temperature and it happens that gas that is sent through those mains subsequent to the gas that the hydrocarbons are taken from will very often take up these hydrocarbons and carry them along to the consumer's premises; so that it is not necessarily a loss, this condensation in the mains. It is practically all utilized. It is very frequently taken up and leaves the main dry, and if taken up by a sudden change of temperature, goes right along the consumers. The consumer ultimately gets the worst of it. It practically turns out that it goes into his service in his cold cellar and condenses in his meter, or if it stays in the gas, it makes a sudden influx of smoky flame. I characterize the consumer's cellar as necessarily cold because from a census we have taken we found they are below the average temperature of the gas at the works. That was the object of the census. If they have got a furnace down there, it is generally not cold. The meter is often in a cold place—cold corner of the cellar. Cellars during seven months of the twelve, when they have no furnace fire are certainly colder than the standard temperatures at the gas works, but it would not be true in the wintertime with an ordinary furnace going where the cellar is often warmer.

[fol. 620] By "cracking" I mean the oil used for carburetted gas is a comparatively heavy oil and not at all

volatile at ordinary temperatures. To convert it into a gas that can be conveyed as a gas, it has to be decomposed into gaseous components, and since the constituents of this gas oil are very heavy, complicated molecules, they go through this heating process, which is commonly said to crack the heavy large molecules into smaller ones. No gas company attempts to introduce any gas oil until the machines are thoroughly hot. It would be poor practice if they did. It is naturally impractical. Oil is run into the cracking chambers—fixing chambers, the carburetter, which is heated up to a very high temperature. They generally try to limit that temperature to 1,500 or 1,550 and the higher the temperature the quicker the gas oil volatilises. It all boils in real gas oil distillate at about 700 degrees. It will not distill usually before 400. Gasoline volatilises more easily than gas oil. That will volatilise at lower temperature than 400 and does in our automobilies. Ordinarily every particle that is introduced into the generator is, under the conditions properly volatilized. The condensation will begin right as it issues from the generator, not when it is put [fol. 621] under pressure by the compressors and boosters but as it flows out, as it issues from the shell of the machine. That amount that condenses there is collected and utilized by the gas company. In the gas business ordinarily a representative of the gas company visits a consumer's premises on an average more than once during the course of a month to read the meter. If I am a consumer and I sent a complaint to the company, that my gas stove is not burning, they will go promptly and willingly to adjust it; they do not do much cleaning, unless it is simple. Whether or not I am burning 537 B. t. u. gas or 600 or 650 B. t. u. gas, there is always a certain amount of cleaning necessary to be done on the plates and around the orifices of the burners, irrespective of the quality.

In the manufacture of 547 B. t. u. gas between 60 and 70 feet of gas should be gotten from a gallon of oil. The time of exposure to heat is the real cause of any difference. If it is heated longer or hotter, longer with a slow flow of oil or very hot with the same flow of oil, it cracks it up further, more hydrogen is generated, and a larger volume. The factor of 66 2/3 feet is, on the average what is usually produced if the gas plant is efficiently run. If a company

is manufacturing gas of a B. t. u. content or 650, it would make a difference in the amount of gas it should make from a gallon of oil. I would not declare any fixed figure, [fol. 622] except that it would tend to approach 60 feet, instead of being higher. The oil going into the set in the present instance here 50 per cent or more faster, is not exposed for the same length of time to be thoroughly cracked, and it is not a question of raising the temperature very much higher because it is not possible to crack the oil to carbon. So the oil does not have the same chance to become converted into as large a volume of gas, and in experiments it comes much below 60 at times—50 feet. In manufacturing gas with a B. t. u. content of 547, the common factor for generator fuel is around 30 pounds per thousand—30 to 34. If it is 33 1/3 pounds, that would generate 30 feet to the pound of mixed carburetted gas. It would make about 24 feet of blue gas, to make 537 gas, you can make say 800 feet of blue gas with 33 pounds. As to how many B. t. u.'s are there in a cubic foot of oil gas, or what is the B. t. u. content of oil gas, it has never been isolated and tested but by computation it may be from 1,200 to 1,600 B. t. u's. That is as near as I can give it. Oil gas made as oil gas or collected as oil gas is 1,500 or 1,600 B. t. u's and even higher, 1,700. The B. t. u. content of the ordinary blue water gas is about 300, for a good gas. The standard is raising a pound of water one degree, that is the heat unit. As to the heat value of the unit, refuse coal and coke, [fol. 623] the material might be 10,000 B. t. u.'s per pound. The heat units would be about 970 to vaporize a pound of water from the boiling point. Referring to the relative value as a heating unit of the solid boiler fuel they used, and the relative value of tar, the tar per pound might be 1.7 times the solid fuel per pound. I am just estimating, but I know what the tar would be, pretty closely, although I don't know the solid fuel. The tar would be twice as efficient, if the solid full was poor fuel. It would be somewhere between 1.7 and 2. Gas oil hasn't any higher heating ability than tar. Taking it on the dry basis a gallon of tar is around 18,000 heat units per pound. If it is heavier than water it weighs 8.5 pounds per gallon. There are all kinds of small differences in tars.

I said in my cross examination that I thought 22 candle power gas would only contain about 620 B. t. u's.

[fol. 624] That is based on my own observation with such gas as we used at the time we were making the candle power standard. In the manufacturing of this carburetted water gas, the unit is composed of really three parts, generator, carburetter and superheater. Air is blown through the generator and is carried out through the generator down through the carburetter and then out through the superheater and that air is blown through until all of those units are raised to the proper temperature and then the air is shut off. The steam is turned in through the generator and at the same time oil is turned into the carburetter. That steam going up through the generator and the oil going into the carburetter decrease its temperature and that part of the cycle continues until the units are down below an efficient heat operation. If they are making blue gas, to make an illustration, you don't have to put so much oil in the fixing chamber so this chamber — less affected by lower temperature than if we were making a rich gas. At the same time, when we are making that kind of gas, you aim for a larger proportion of blue gas and you turn more steam into the generator, so there is that reason for lowering the generator temperature a little more than usual. [fol. 625] Assuming you were burning something around 2.83 gallons of oil per thousand feet of gas, as to which would cool down below an efficient temperature first, the generator or the carburetter,—that is nothing to answer definitely; if the generators in many cases are cleaned once in twelve hours, there is a continual changing of conditions from beginning to end. Then if a machine is run on a definite cycle like five minutes, to make them both come down to the unprofitable temperature at the same time, there is always a change in the blowing and steaming period. If you find the generator is cooling off too fast, then the blowing period out of the five minutes is made a little longer, to have a higher point to start from, and it is the object of the whole operation to get the whole three units in balance by intelligent changes. All that really cools these things off is the steam going into the generator, and the oil going into the carburetter. That is, the more oil you put in the carburetter, the quicker it cools off. There must be some point where the carburetter cools off before the generator, where you have to stop your run because of the

coolness of your carburetter rather than because of the coolness of your generator. There are innumerable changing conditions in there. If you have a condition like that, you make a better producer gas in the generator, which is burned in the fixing chambers by secondary air. If it is the other way, that you don't want to use so much heat into the fixing chambers to prepare for cold oil dropping in you [fol. 626] can run with a low fire in the generator and make more complete combustion to CO^2 in the generator unit and raise the temperature less in the fixing chambers. That is, you produce a purer producer gas for combustion in the cracking chambers and, in that way, keep them in balance. All that cools off the carburetter is the fact of putting oil in there. And all that cools off the generator is the putting of steam in that. If you increase the amount of steam you put in the generator, then it must cool down faster. If they find that the generator cools too fast, a change is made. If the steaming period is three minutes, then they run less steam in each minute. The more steam we turn in the more blue gas we make, and therefore the more oil we have to put in at the same time, to make our B. T. U. gas. There is a direct relationship between those. But you reduce the steam in the generator and make less blue gas, and then you have less oil that goes in the fixing chamber. You must understand that the fixing chambers are heated by burning the producer gas from the generator and if there is a necessity of having a higher temperature there for the oil to start with, they make richer producer gas right in the generator, by deepening the fire or blowing slower, and then burn this richer producer gas in the cracking chambers. If it is going to be a question of using less oil, they work right in the opposite direction, with a shallow fire and blow the air through quicker, turning it into carbonic oxide. The [fol. 627] limiting temperature or limiting efficient operation is observed by taking the product of the generator or the fixing chambers. The gas oil usually volatizes, but it is not so easily cracked in the fixing chambers. If is observed at the outlet of the fixing chambers that it is oil and not tar which is being collected, they know that too much oil is being put in and not high enough a temperature. Practically in the case of a large admission of oil, you could heat the fixing chambers as high as you dared, which is not

much over 1,500, and then observe by trying out how much oil it will take in a five minutes cycle, with three minutes admission, to thoroughly crack it. You know quick enough by trial what the limit is. The limiting point generally is in the generator because you can do things to that easily, when it is getting out of balance.

In the manufacture of gas it is necessary to make a great quantity of steam. To make that steam, you can burn solid fuel or liquid fuel. As to whether it was economical to burn water gas tar at something over 7 cents a gallon, rather than to burn solid fuel at about $9.29 a ton, I haven't had that kind of a problem lately, and I will have to work it out with a lead pencil. For the value of the fuel in money and [fol. 628] the estimated evaporation, the oil tar required would cost about one-ninth more than the solid fuel. It does make a difference what kind of a solid fuel you use. I assumed an inferior fuel of about 10,000 B. T. U.'s a pound. I do not know what solid boiler fuel the Kings County Lighting Company used in 1923. I just presumed it was refuse coke. I said I confined it, when I answered before to coke. Assuming the company buys coke, separates it out and uses the large coke in their generators and the small coke as boiler fuel, I could take about the same valuation as I have before—about 10,000 heat units to a pound. There are other considerations about firing and waste material, and so forth. The oil tar would be worth more than its equivalent by a comparison of the heat values, and that is what I am rather vague about. If this coal, to make 100 pounds of steam, is worth 6.4 cents, and is used instead of oil tar at 7 cents, more expense, as for firing waste, and cleaning the apparatus, and handling, would be added to that 6.4 cents, which I am not in a position to estimate. If your solid fuel cost you 9.29\frac{1}{2}$ a ton, I hate to give an answer as an expert as to how much our liquid fuel should cost before it would be economical to use it. I would guess at 8 cents a gallon. My answer before was it would be worth a ninth more than the solid fuel in proportion to its heating value. Then the other considerations I did not take into consideration—the manipulation. There are less repairs and less expense attendant. In 8 cents, about one-fifth of it is extra expense. Basing these two fuel on their evaporating value per hundred

[fol. 629] pounds of water, in common practice you could evaporate that with one gallon of tar. Evaporated with coke breeze, I took seven pounds of water to a pound of breeze. If it is poor breeze, it might be five or six; but I took it at seven. Then taking it at seven pounds of water for one pound of breeze, that would make the cost of the breeze per pound about 6½ cents, against tar at seven cents. Neither one, the tar or solid fuel is taken up to its theoretical value.

[fol. 630] Brooklyn, New York, March 27th, 1924.

DR. JOHN F. WING

Cross:

I have here (indicating) a computation of the comparison of fuels, comparing coke refuse, water-gas tar and solid boiler fuel. As a tentative estimate of the extra expense, labor, and so forth, in handling solid fuel, I conclude that it would be at least 75 cents a ton. Adding that to the cost of the fuel given as $9.295, makes the total cost of a ton for the basis of the computation $10.04 or .502 cents per pound of fuel. On the estimate of evaporation suggested the other day, 100 pounds of steam per gallon of oil tar, and 7 pounds of steam per pound of solid fuel; 1 gallon of tar equals 14.3 pounds of solid fuel, which, at ½ cent a pound, is the equivalent of tar at 7.15 cents per gallon.

The second computation by the heat values mentioned at that time, 18,000 B. T. U. per pound of tar and 10,000 B. T. U. per pound of solid fuel; 8.5 pounds of tar per gallon, multiplied by 18,000 B. T. U.; multiplied by 80 per cent. efficiency of the fuel, gives 122,400 B. T. U. available per gallon of tar. Breeze, 1 pound by 10,000 B. T. U. per pound, by 65 per cent. efficiency, equals 6,500 B. T. U. of boiler fuel per pound. Then dividing 122,400 by 6,500 equivalent to 1 gallon of tar, equals 18.8 pounds of solid [fol. 631] fuel at ½ cent per pound, the value of a gallon of tar compared with solid fuel would be 9.4 cents. That is the relative cost of the fuel so computed, $10.04 a short ton. The computation of the boiler room labor was based on $5 for a fireman and $4 for a helper. I have no informa-

tion about the actual costs in these stations, to arrive at a differential of 75 cents per ton. The first figure that I gave in the comparison was based upon the ability to raise water, to vaporize water. And the second one was based upon the heat content. They actually use the boiler fuel to vaporize water. The second comparison, I think, shows more nearly the probable truth. As to the use of boiler fuel to vaporize water being the proper method of comparison, it would seem as if the first estimate made the solid fuel too efficiently used, being breeze and refuse, and it brings it up nearly to 80 per cent. efficiency, which is not obtained with that kind of fuel. One is the minimum and the other perhaps is the maximum, and they are both entirely possible. If we should burn gas oil rather than tar under the boilers, the comparison with the tar would be practically the same per pound of tar, it is less efficient than gas oil. A gallon of gas oil weighs 7.5 pounds per gallon and a gallon of tar weighs 8.5 pounds. A gallon of gas oil weighs something like 7.5 pounds, if it is high baume, 33 or 34 gravity. It would be more expensive to use water gas tar at something over 7 cents a gallon than it would be to burn gas oil at something over 5 cents a gallon. The gas oil at 5 cents a gallon would [fol. 632] be cheaper—5 cents to 7. Gallon for gallon, they are practically equivalent. In manufacturing gas, we introduce oil into our carburetor. A certain volume in weight of fixed gas is produced, and a certain volume of oil which is not entirely cracked to gas and remains heavier kind of liquid which does not volatilize or stay volatilized. That is what is know- as the tar. Then a smaller percentage remains of carbon from the complete cracking of the hydrocarbons. At that stage of the operation the amount of carbon might be five or seven per cent. That is, five per cent. of the oil would make a carbon deposit in the machines. Then the subsequent blowing and steaming operation picks up considerable of it. Nothing else that is ever handled is made except oil gas residual, in the natural operation, that is, in the make. The oil gas made in the carburetor has a certain weight. I haven't a definite figure in my mind as to the weight of that per thousand feet of oil gas, but it is something like 16 pounds; 15 to 17, it is in that vicinity. The weight of a thousand feet of water gas is variable. It is practically something like 12.5

of 13 pounds. Every product is a little different. Without referring to any particular product it is practically the same weight as air. A foot of air under standard condi- [fol. 633] tions weighs 76-1000th of a pound. The weight of oil gas is comparable. And this company stated that their residual from a gallon of oil was 4.8 per cent. I would have to inquire what the weight per gallon was or whether it is very good oil or not to say what would be the amount of residual they would get, what weight of residual per gallon of oil. Some gas oils have 34 or 35 Baume gravity, and other companies use much heavier, down to 28 or 26 Baume. If a gallon of oil does weigh 7.5 pounds, 4.8 per cent. would be .36 of a pound. They measure their tar in gallons. I cannot tell very closely from those figures that we have, what percentage or what weight of a gallon of oil goes into the gas. If the gas oil is cracked to such an extent that they have a small tar residual like this, there is more carbon formed, which would not be as good, if there were 15 or 16 per cent. of tar formed. And that change would be enough to throw out our calculations. As they get along with less oil per thousand, it means that a larger proportion and a larger proportion of the gallon of oil goes into the gas than with 16 pounds I mentioned. I do not mean to say that in operating the way the Kings County Lighting Company does, they would have more than a 5 per cent. carbon deposit. I don't think so. Assuming a 5 per cent carbon deposit, the weight of a gallon of oil that goes into the oil gas would be about 6.75 pounds, if it was [fol. 634] 5 per cent carbon and 5 per cent oil, but that is not correct, either, because they gave their 4.8 per cent by volume of tar. It would be a very minor percentage; it would be almost negligible. It might be something like 6.5 pounds. Gas weighs about 80 pounds to a thousand cubic feet. Dividing one by 76-1000th, it would make it 13 cubic feet to the pound. And then a thousand feet of oil gas would weigh 76 pounds. That is dividing the weight of a foot of air, taking the reciprocal of a foot of air, 76-1000ths pounds. 6½ is my guess at what the weight of oil gas from a gallon of oil would be. Oil gas would be in cubic feet about 84 feet. A gallon of oil would only make 66 2-3 cubic feet. The more complete the cracking, higher cracking, changing oil and tar into gas instead of having a big tar

residual. And in this case it would signify that the volume of oil gas was larger than 6 feet. But in giving these figures the other day of 66 2-3 feet of gas from a gallon of gas oil, I did not consider that a company would crack oil so far that they would only have 4.8 per cent. residual. I said that is out of my experience. If they did so crack it they would get something over 80 feet per gallon of gas oil. To make any complete computation, you have to know the gas analysis and compute the weight. My figure, I have given is approximately correct. If they shou-d manufacture 650 gas rather than 547, their residual in percentage would probably be 18 per cent by volume of tar. Assuming [fol. 635] first that our appliances were properly adjusted, and second that the price per thousand cubic feet of gas remained constant, it could not be stated absolutely at all whether 537 or 650 British thermal units gas is more economical and useful from the consumer's point of view. Referring to the efficiency of the consumer, assuming the price remains the same and the appliances are properly adjusted, the richer gas is cheaper. 650 B. T. U. gas is more economical and more useful to the consumer than 537 B. T. U.'s.

It is true that the consumer in purchasing illuminating gas is buying heat, he is not buying anything else. And in buying heat he is interested primarily in getting the heat to do certain kinds of work in the quickest time possible. I made the statement that in using approximately 4.5 gallons of gas oil in the manufacture of a thousand cubic feet of 650 B. T. U. gas, you would have a greater amount of carbonization, for the reason that the additional quantity could not be volatilized properly. There is a way of regulating the flow of the additional gas oil necessary to make 650 B. T. U. gas so that this problem of carbonization could be minimized. So that if you do succeed in minimizing the *the* problem of carbonization by decreasing the flow of the gas oil into the carburetter, you might succeed in cracking proportionately the same amount of gas oil as you would if you were manufacturing 537 B. T. U. gas, within the limits that in that condition there would be a proportion [fol. 636] ately less volume of blue gas for a carrier, one-eighth less.

Referring to the problem of saturation, the carrier is saturated by vapors that are taken from the gas oil. And that is practically hydrogen gas. If you increase the temperature of the hydrogen gas, of course you raise the point of saturation. That isn't a practicable thing to do, because the gas is not kept hot. It is kept hot in the apparatus and comes out at 1500 degrees, then the condensation in cooling for practical distribution begins. There is a period of time there in the cycle when this saturation of the hydrogen is going on, when we could increase the temperature so as to increase the point of saturation. The oil would would be entering the machine about 50 per cent of the time of the cycle, broadly. The time that the cracking chamber is at a sutiable temperature for most efficient cracking would be considerably less than this. It is a matter of averages. They put oil in when it is very hot and then continue introducing it until it is below the most efficient temperature and get the best average they can. The top of the carburetter during this cycle at the end of the blow is blazing hot, perhaps 1400 degrees. That is not the highest part, because the entering of the oil makes it the coolest. At the end of the cycle the top of the carburetter where the oil enters is always black and down to 700 or 800 degrees, and still they introduce oil clear up to the last. It is taken care of partly in the farther part of the crack- [fol. 637] ing chamber, where it is still almost hot enough. Whether you are feeding the carbureter to establish a gas having a content of 650 B. t. u.'s per cubic foot or feeding the carburetter to establish a gas having 537 B. t. u.'s per cubic foot, the difference in the practicable cycle of maximum heat would be practically negligible in one case as distinguished from the other. The temperature in the carburetter is too high at first and too low at the end, and as it crosses the temperature of maximum efficiency, it goes the other way. In other words, there is no period of time when it is at its maximum efficiency except an instant, passing through it. I might say that in this changing of the temperature of the fixing chamber from the high to the low point there is only one point of the maximum efficiency. That is a practical efficiency. There is a practical range, say 100 degrees each side of the maximum. If the oil goes in very fast in the stream, the drop of temperature is

quite abrupt; if it goes in slower, for leaner gas, there is a longer period than of practical range and of course more [fol. 638] efficient cracking in the operation. So that in feeding the carburetter for 650 B. T. U. gas you can regulate the extent of the cracking by regulating the flow of the gas oil into the carburetter, you would have to increase your cycles. To make the oil gas with the same efficiency, you are limited, just so to speak, to handling so many gallons a day or hour in the apparatus. If you have to put in more oil per thousand, to have the same efficiency, you would have to make less thousands. You cut down the capacity of your machines, when you make the richer gas, if you do so by putting the oil in at a slower rate, or the same rate.

Contemplating a situation where the company is going to make 650 B. t. u. gas per cubic foot, and where it is necessary, as agreed here, in order to make 650 B. t. u. gas per cubic foot that a certain quantity of oil is necessary to be used over and above what has been used in the production of 537 B. t. u. gas, I think in my original testimony I said that we would have to use at least 4.65 gallons which is 1.8 gallons more than before. The additional oil put in at the same rate, or rather in the additional proportional rate, I would estimate would make between 80 and 60 cubic feet per gallon. And the reason for that is there would be a [fol. 639] greater amount of carbonization if the operator attempted to raise the temperature high enough to attempt to handle the larger amount of oil in the same time. It would be corrected if corresponding changes in temperature and so forth were made. The carburetor can only be adjusted in temperature. The carburetor is a fixed part of the apparatus and not susceptible of adjustment except in regard to the temperature. The flow of gas oil into the carburetor can be adjusted so as to make it more slow or more fast, as the occasion requires. As to the average we would get out of this 4.65 gallons of oil, if it were not for following the questions asked me as to where I arrived at a yield of 84 feet per gallon, if we overlook that, my answer would be that you would have an answer of about 60 feet per gallon. Bearing in mind the results of that other computation which I made—on 537 B. T. U. gas and on given figures and without any knowledge of the constitution of gas, and

having arrived at 84 feet for that, it would make the average yield something like 67 feet per gallon. I would [fol. 640] not want to accept that or give that as my opinion, because that is based on data with which I am not exactly familiar. In the case of putting in the larger quantity of gas oil I feel sure that there would be nothing like 84 feet per gallon produced, and that part of it would not contribute to the average. I have given the figure as 60 as the additional—the average in gas if 4.65 gallons of gas oil were used. There is no other practical way by adjustment of the carburetor, to raise that average. I have never inquired about how many gallons of gas oil were used here to make 22 candle-power gas. In Boston, when we were making it about 1907, we used from 4.1 to 4.25 gallons.

Mr. G. R. Woods is the chief engineer of the New York Consolidated Gas Company. He was the engineer for a long period while they were making 22-candle power gas or gas very high in B. T. U.'s. I could not give any definite figure as to how much oil could be put into the carburetor without throwing off the balance or without cooling off the carburetor before the generator. If some testimony were [fol. 641] read to me given by Mr. Woods on that subject, I would believe his experience, but I would say that nobody could predict that I had that kind of experience in making that high kind of B. t. u. gas. If in hearing before the Public Service Commission, in a proceeding changing the standards of purity, illuminating and heating power of gas in New York City, held on March 28th, Mr. Woods testified—1922. The question was asked what constituents of the gases that are there, what particular gas drops out; that is, when you drop out a gallon of gas oil what particular gas drops out.

"A. It isn't there, because if we put in, that is, within reasonable commercial limits, you can run up to five gallons of oil. Now, there is this to be said. I want to get straight on this. You have a heat balance around about four gallons of oil. In other words, in making blue water gas with the intermittent system that we operate generally speaking, produces enough waste heat to pass over into the carburetor and superheater which is sufficient to vaporize or gasify about four gallons of oil. If we use less than four

gallons of oil there is a certain amount of that waste heat going away for which we have no use except for putting into waste heat boilers."

That is a true answer as to how much oil you could put into the carburetor without cooling it down before the generator cooled down. Changing the method of operation, it can be done. It is practicable that four gallons of oil per [fol. 642] thousand cubic feet can be put into the generator without cooling the generator off so rapidly so that you have to start your blow quicker than you ordinarily would if less oil were used, but it means a different arrangement of the operating cycle. Answering the question the other day, counsel tried to have me make clear the way it would be changed for handling different quantities of oil for the run, and it afterwards seemed that I used figures which would make it clear. If we started to make a high B. t. u. gas, we rob the generator of a certain amount of heat and thefefore we do not get the efficiency and the amount of blue water gas out of our generator fuel that we would get if we were making a gas of a smaller number of B. T. U.'s. They may have different cycles, but the proportion of running time would be about the same. The operation can be modified in this way: Of all the fuel used, half of it goes to making blue gas, half of it is burned for producing sufficient illumination in the generator and in the carburetter; if a large quantity of oil is introduced in making the carburetter warm, you do it in this way: Half of it is used for blast going through the generator making producer gas; [fol. 643] about half of the value of that half is converted into a producer gas, and the other half is completely burned. If it is a question of getting the carburetter higher, less is burned in the generator completely, more producer gas in proportion is produced, which is burned in the fixing chambers. It is a question of the utilization of heat. It is not so that if you use a smaller quantity of oil, no matter how you change the cycle, you are going to waste more heat. Mr. Wood does not consider, I think, all the things you can do. To fill out what I just said, if it is run in the usual way, we use half of the fuel burned completely in the generator, and the other half goes to heat the carburetter. If you want to use less oil, giving less heat in the carburetter and

blowing the air through the generator more swiftly, you obtain a higher heat there and make a leaner producer gas for heating the carburetter, so there is not heat value enough in the producer gas per cubic foot to heat it in the same proportion as before.

Then another thing that is usually done is to reduce the depth of the generator fuel, so that the air does go through quicker and burns completely to carbonic oxide, without being reduced by the upper layers of incandescent fuel. That was a serious question when the gas standard was lowered, and the way out of it has been found by experience. In our case we have vastly increased our production of gas per [fol. 644] unit and, in fact, we can drive it so far that we don't have heat enough to heat the carburetters for handling three gallons of oil per thousand, by resorting to those expedients which are known to technical men. You get greater aeration, that is, aeration of fuel by any of these methods. That is, in the generator itself by changing the heat value inside of the generator. It is commonly expected when solid fuel is burned, carbonic oxide is the first product at the base of the fire. If it goes up through the higher layer of carb-naceous fuel, it produces a carbonic acid which will burn. That is, you get rid of your CO^2, and it goes into CO. Either by reducing the depth of the fuel or increasing the velocity, you can reduce that production of fuel gas. Going back to the figures we were working on a few minutes ago, figuring out the weight in manufacturing 547 B. T. U.'s and assuming 48 per cent. residual, you get an answer of 84 cubic feet. A gallon of light gas oil weighs 7.5 pounds. It would have 16 per cent. residual. If 16 per cent. by volume of gas oil went to tar and 5 per cent to carbon, 5.67 pounds would be the weight of the one gallon of oil that went into the gas. A thousand cubic feet of gas [fol. 645] weighted 76-1000ths of a pounds. In arriving at the figures I gave the other day, and the amount of additional oil necessary to produce 650 B. T. U. gas, I assumed that one gallon of oil would produce 60 feet of gas if instead of producing 60 feet of gas, it produced 74 feet of gas, it would change the figures that I gave. It would not reduce the amount of additional oil, in that direction. It would make more oil gas than we talked about. In order to get more oil gas from a gallon of oil, we would not use

less oil. I mean it would not have as high a B. T. U. content as the other oil gas. I had a report from the laboratory the first of the week that showed a difference between 110,000 B. T. U.'s per gallon and 85,000 using oil at the same rate, just changing the temperatures. So that it becomes an important thing, using oil at the same rate, just changing the temperatures. It becomes an important thing when the Gas Company comes to order oil, to get the baume gravity very carefully. Practically that is the only thing you can demand. Oil Companies won't accept any other specification. This difference in the B. T. U.'s in a thousand feet of oil-gas is very largely caused by the difference in the oil.

Using the same oil under different conditions, you get [fol. 646] as wide a range as 110,000 B. T. U.'s per gallon down to 85,000 B. T. U.'s per gallon. If we have accounted for all of the material some of the carbon burns up the stack and some tar may not be collected—making 16 per cnet. of tar by volume, which would be 1.36 pounds, at 18,000 B. T. U.'s per pound, 24,400 B. T. U.'s; carbon .00375 of a pound, taking 5 per cent. by weight with a heating value of 14,400 B. T. U.'s per pound, is 5,400 B. T. U.'s. If you take the value of gas oil, 14,400 B. T. U.'s per gallon, you have an unaccounted for of 114,200 B. T. U.'s to apply to 75 feet of oil-gas, which is equal to 1,520 B. T. U.'s per cubic foot. That is low, and this ignores any losses of burning out when the machine is open for blowing, and all that, which is incidental to the operation. It points directly to the fact that this 75 feet per gallon would be lean gas.

WING

Redirect:

I have had experience, when the quality of gas is changed in a district from a higher to a lower B. T. U. content. We happened to take a census of a particular district in our own particular district in our own territory in 1917 before we lowered the standard definitely to the present standard, for our own information, and that was taken, incidentally, to find out the census of how many people were using appliances and what they had in the houses. In 1918 and [fol. 647] 1919, when the standard was lowered, and the

quality of the gas was lowered, they repeated that census to note the change in the construction of those two groups of consumers, and besides that we made general investigations in our own district year by year for the consumption per year and the consumption in other cities. There was, on the average, no increase in consumption per meter in these districts in which we took the complete census, and in the district as a whole, very moderate changes, sometimes higher and sometimes lower. That was a reduction in the B. T. U. content in that gas, and I did not find a corresponding increase in the consumption of gas, in the number of thousand feet consumed. (Examines witness's paper.) In 1917 the average of the State test of our gas was 578; in 1918, 531; 1919, 537. And in those cases where I had reduced it there, there was no tangible increase in the quantity consumed. It would theoretically be natural to expect an increase in the quantity consumed when the B. T. U. content is lowered, and vice versa, a reduction in the quantity consumed when the B. T. U. content is increased. I do not find that so. It does not follow. I think the particular reason for it is that many of the 200,000 meter holders were careless of the lower B. T. U. gas; in either cases it was a question of whether they burned it efficiently or not; it was a question of burning the gas for the same time for the same purposes, especially applicable to domestic consumers.

The housekeeper is a creature of habit and will boil or cook articles the same length of time, and in boiling are [fol. 648] usually—almost always—wasteful; in boiling a teakettle they will heat it up to boiling and then let it boil. In using radiant fires for heating, there is no regulation of the appliance to temperature; if it is lighted it stays lighted, and with water heaters the same is true. There is something in the more efficient application or utilization of the lower B. T. U. content, in that a gas range, where it was formerly used with the richer gas, would be turned on full, and all the gas that would come out at the pressure was used. The gas generally was turned on too high, with rather a lambient flame, with not sufficient air admitted. When the lower B. T. U. gas was put into the same appliance, there would be better aeration and a shorter, more intensive flame, less yellow tip. So far as that applied, that caused greater efficiency directly. It is desirable, no mat-

ter what gas you are distributing, to have it as near a uniform heat content at the consumer's premises as possible. It should be distributed to the consumer at as nearly a uniform heat content as possible. Whatever his adjustment may require. It is not practicable or possible to distribute a 650 B. T. U. gas. In further explanation of the reason for less consumption, I would say that we at the time of lowering the gas made a particular inspection of all our consumers' appliances, heating appliances, and adjust-
[fol. 649] ments, adjusted them for the gas that we were going to produce. If a high B. T. U. gas cannot be distributed with as uniform a heat content as a lower B. T. U. gas, it must follow that it is less efficiently utilized. Especially if the primary regulation is done, and if no regulation is done when the change is made, the condition is worse. Assuming that the adjustment is made as well as it humanly can be, notwithstanding that, a high B. T. U. gas can not be as efficiently utilized because it can not be distributed with the same uniformity of heat content. That is a factor. The plaintiff is supplying gas ranging around 540 B. T. U.'s. If we went to a 650 B. T. U. gas to the same consumers and their appliances were adjusted as well as they could be to 650 B. T. U. gas, the volume of consumption would not be less in proportion at all in proportion to the increase in heat content. It might be expected, and it might be true to a very small extent, that these people would use a fewer number of thousand cubic feet of gas, a smaller volume of gas, if it was a 650 B. T. U. gas than they would if it were a 540 B. T. U. gas. It was not found to be true when the reverse was done, or when we studied the reserve conditions. That is, coming from a higher to a lower B. T. U. I haven't had any experience in raising from a lower to a higher B. T. U. I do not know of any cases where that has been done. I know where they have, the lowest in North Ameri-
[fol. 650] can or Canada and they have never raised it. My opinion is that there has not been sufficient dissatisfaction to cause a demand for an increase. There have been many instances of reductions, everywhere. The gas companies, it seems to me, in all cases, have taken the initiative. They have done it because it is easier to supply a satisfactory product, and *and* is cheaper. I do not think it is possible to attempt to maintain a 650 B. T. U. standard in the ordi-

nary community like ours. In my testimony I think I have stated the various reason- why it is not. The inability to distribute gas of a uniform heat content when you have such a high B. T. U. content is an important reason. And that leads to various consequences, like change of the quality causing unpleasant conditions with the appliances, utensils, etc., and involves considerable hazard. There is so much more chance of having incomplete combustion for a number of causes from a rich gas without becoming richer, or from a shot of gas that is unusually rich, causing deposition, forming stoppages in the burner holes, all tending to produce incomplete combustion, and incomplete combustion means that some of the constituents of the gas escape without being burned to harmless products. When there is incomplete combustion some products are realized that are not harmless. For instance, gas is composed, except for its contents of nitrogen, of hydrogen and carbon compounds, and products of complete combustion are carbonic acid and [fol. 651] water. If there is incomplete combustion you have degenerated hydro-carbons with water and an incomplete combustion of the carbon itself, which means carbonic oxide instead of carbonic acid. Carbonic acid is unpleasant, suffocating, and carbonic oxide is poisonous. That is the CO that Mr. Hyatte referred to so frequently. It is a product of incomplete combustion. It always obtains in incomplete combustion. It alway attacks the red corpuscles of the blood. It is very poisonous and produces paralysis and death. It is entirely odorless. That contributes to the hazard. Also when there is this incomplete combustion of the hydro-carbons there are compounds formed and very obnoxious odors produced which is a warning to technical people or intelligent people that there is something wrong.

The meters commonly used for all sorts of consumers have lever diaphragms. They act like bellows in measuring the gas by its motion. At best there is considerable trouble in keeping them limber and in working order, which depends on their being pliable, and preventing them from rotting. In the case of a gas over-saturated with oil or a gas carrying oil in suspension, the oil which is in the gas washes out the oil with which the meter diaphragms have been prepared and renders them unfit for use. That would be the gas that has a much higher B. T. U. than the present gas. In my

opinion it would be more difficult to keep meters in order with a 650 B. T. U. gas than a 537 B. T. U. gas. If a meter [fol. 652] gets out of order it does not register correctly. It makes trouble for the consumer, because it often does not register at all, but it is a case of expense for the gas company. One of the strongest causes of trouble in that respect of meter condensation and getting them out of working order, does come from trying to crack too much oil in making the gas. There are unsaturated products formed where the oil goes through the apparatus too swiftly, they are not cracked to tar and condensed but are carried along there in suspension or in vapor formed in the gas, which settles somewhere later and oxidizes to gummy products that stiffen up the meter diaphragms and plug up services. I am strongly of the opinion that a company's expense for meter repair would be increased, if in furnishing a 650 B. T. U. gas, above what those expenses would be for 537 B. T. U. The expense for repairs would be considerably increased. There is a periodical taking in of meters, and that period would have to be shortened, if you went to a higher B. T. U. gas. There are companies which had continued the use of high candle-power gas and had almost insuperable difficulties, so bad that it got beyond being a question of expense to a question of getting around to the meters, overhauling them fast enough. A high candle-power gas, and a high B. T. U. gas is mostly a parallel definition, so far as this question is concerned, at least. There was a committee of the American Gas Association in existance for three years studying this subject, and in the results of the investigations that have been carried on with the help of experts [fol. 653] from the Bureau of Mines stationed in Pittsburgh, they have definitely fixed the cause of these gummy troubles, which is in the oil cracking. In the case of these companies who have carried on, on the higher standard, they would have had a poorer cracking, because they were obliged to handle larger quantities of oil, which is degenerating in quality year by year, as available to the gas companies. I don't know of any place in the country where as high as 650 B. T. U. gas is used at the present time. I remember places mentioned out west somewhere, I think in Arizona, where they have a municipal regulation calling for 600 B. T. U.'s. I don't know what is the general mean.

I know that in New England there is no state with a higher rate than 528, and there are two lower.

We have here a stove, one that is sold by the company—Vulcan Stove, manufactured by William Crane & Company. (Witness looks at same.) I have seen it there just as it is. I don't know whether it would be possible to adjust that stove so that it would burn 650 B. T. U. gas. The manufacturers, I suppose—that is an opinion, do have no appliance which uses the 650 gas. This stove has a number of burners, as it is gotten up. That is a Bunsen Burner (indicating).

Defendants' Exhibit No. 4 looks a good deal like the valve and spud that is on this stove; defendants' Exhibits 4 and 5 look like these pieces called cocks. Defendants' Exhibits 4 and 5 look like the cocks that are on this stove, the same things. This stove has got a number of cocks that look like [fol. 654] Defendants' Exhibit No. 5, and one of Defendants' Exhibit No. 4. Take Defendants' Exhibit No. 5, for example, that has got a way of arranging this, a way of enlarging or reducing the gas orifice, and the mixing chamber has at its inlet side an air shutter. That is an adjustable contrivance to be changed so that you can use a higher or lower B. T. U. content in there. I cannot by inspection say whether that, adjustable as it is, could necessarily be adjusted to accommodate a 650 B. T. U. gas. Although it is adjustable, it might not be adjustable enough. I could tell by experimenting with gas of that quality. Although this is made adjustable so far as the orifice is concerned and the air shutter, yet it may be that it is not right for a 650 gas. And it might be that it is. That is not determined until it is tried. Any quality of gas can come out of the orifice with practically all apparatus. It depends upon making a proper primary air mixture. That depends upon beside the orifice the air the shutter. This particular part here. (indicating.) You cannot tell until it is tried on that quality of gas, whether that is an air shutter which is sufficient or not. I cannot tell without a test here whether that could handle 650 B. T. U. gas or not; nor can I say whether adjustable appliances like this are put out, that cannot be changed to utilize as high a B. T. U. content as 650. I don't know that I have ever run across any. I have never run across any that [fol. 655] could not be adjusted up to 650 gas. I had had

no experience with any, and, at the time we were making 650 gas, that was before the days of these appliances. That was before the days of heating appliances of this kind. When gas was used for illumination only. Take this piece here (indicating); if it were adjustable, the householder could make the adjustment to change it from 537 B. T. U. gas to 650 gas. The ordinary fellow could do it all right, but he would have to be instructed how. To change the orifice, change the air shutter, he would have to be instructed, and to watch the results as the flame came out of the burner. That is the only way to tell whether you have got it right or not. The gas companies discouraged the ordinary householder doing it entirely, because there is so much hazard connected with it. If they adjust it for a gas that seemed to be coming richer and admitted too much air, and then later got the average gas or gas more than the average, it would flash backward and you would have the consequence of incomplete combustion and the production of carbon monoxide. Suppose, that all three burners were lit, you could adjust one so as to have a yellow flame. And you could adjust one of them so as to have a blue flame. A different height of flame can be adjusted too. So any man could make an adjustment here. You could adjust it so to have a nice yellow flame reaching a certain height. And some one else could adjust this other one so as to have blue flame. The ordinary householder or *or* ordinary citizens [fol. 656] would have an opportunity to know the utility of each flame, but probably they would not. The ordinary householder doesn't pay any attention to instructions—if that is evidence. The ordinary consumer would not know if he did not have instructions. If these need adjustment, it ought to be done by an experienced man. That is the practice everywhere I know. It is possible that this stove we have right here (indicating) could not be fixed up, could not be adjusted to handle 650 B. T. U. gas. So to tell whether that was so or not, the manufacturer might guarantee it, but no other way.

This is a table burner. (Table burner shown witness.) On a Bunsen type burner, it is not adjustable. It is not adjustable either by air shutter or gas orifice. A man who buys that and has a 650 B. T. U. gas, might know that is right, and he might not. As to its being suitable for 537

B. T. U. Gas, just what it was built and adjusted by, is the stand. It cannot be suitable for both or either. If it will give satisfaction and be safe for 537 B. T. U. gas, it would not be for 650 gas.

(Mr. Moran: I will ask to have that marked for identification.)

Suppose that is suitable; suppose that is built for 537 [fol. 657] B. T. U. gas and you put 650 B. T. U. gas into it; there would be insufficient primary air drawn in here to make a mixture which would burn completely at the outlet points here. The flame would be smoky, it would be very smoky, and smoke would deposit from the flame on the utensil, then it would deposit on this opening where the mixture comes out on the burner and sooner or later it would partly choke up; it might go so far as to choke up altogether. The worst that could happen is that the gas flow would continue to come as far as this orifice. If it wasn't possible for the mixture to get out to the burner, then the gas would have to come out at the air intake unburned. As fast as this outlet at the burner choked, the gas flow would continue at the same rate; the air would be continually reduced until yo- got to a point where not even the gas which comes through the orifice would come out there, but it would come out here (indicating). That would be undiluted gas, poisonous gas, and of course we all know what happens if there is anybody around. Any gas used for illuminating purposes is poisonous, and that would be 537 gas too. If it were made for 650 B. T. U.'s, then 537 gas would not be burned in it, because the excess of air would cause the flame to flash back, that is, the mixture would burn back in this tube, (indicating) in the mixing chamber and burn as it comes out of the nozzle right at this point (indicating.) That is, as a product of incomplete combustion.

[fol. 658] (Table burner received in evidence and marked Plaintiff's Exhibit No. 74.)

That is commonly called a table burner, a two-burner hot plate. (Shown by witness.) I don't know if hot plate is the trade name for that, but I think it is. The two burners are adjustable. There is an adjustable shutter on it. As far as I can see the gas orifice would have to be

drilled for letting more gas through, or the whole cock changed for letting a richer gas through. That is, the whole cock would have to be changed, if that is now a 537 gas orifice, the right size for 537 B. T. U. gas, and you wanted to use 650 gas, you would have to get a whole new cock. If it is right for 650 gas and you wanted to use a lower gas you could accomplish that by changing that gas orifice. The thing would have to be unscrewed to do that. That would be something that the ordinary householder would have difficulty in doing. He very likely would not know what to do.

Mr. Moran: I would like to have this marked in evidence, also.

(Double burner received in evidence and marked Plaintiff's Exhibit No. 75.)

Assuming that these three gas-consuming appliances we have here are in use in plaintiff's territory at the present time, and all adjusted to accom-odate or utilize efficiently gas of 537 B. T. U's or, in cases where they are not adjustable, so constructed to use that gas, the company's men would have to go around to all such appliances and [fol. 659] adjust the air and the gas, and they could not adjust it for 650 gas in going up from 537 gas, by one change. They would have to do it in two steps. Take this double burner, they might have to notify the consumer that he would have to discard that entirely, that is a prospect. If it is built for 537 B. t. u. gas, it could never use 650 gas. If it never could use 650 gas, B. t. u. gas, and he went to work and used it, all the troubles that were mentioned, troubles and hazards would happen. With the hot plate, plaintiff's Exhibit No. 75, he necessarily would have to put in new gas cocks as long as it has no adjustable orifice And the stove would have to be adjusted in two stages, the same way. It is possible that this stove could not be adjusted to accommodate 650 B. t. u. gas; that is, the gas orifice here and the air shutter might not have latitude enough for adjustment to accommodate that. You would not have to get a new cock with the proper gas orifice in it. I think the cock can pass any kind of gas. It can be adjusted for a smaller flow. The air shutter at the worst would not be adjusted for the 650 gas at all. At least the place here

would have to be changed. The burner could be used after a fashion, because you are turning down the gas, and if the mixing chamber is not large enough, you would find by experience that it would have to be thrown away. If the mixing chamber is large enough, it might not have to be thrown away, and on the other hand, it might handle a considerable volume of gas. You can never tell until you try. The com- [fol. 660] pany would have to go to work and get one range of each type that is used in its territory and experiment with it on 650 gas, or something like that; and then notify everybody that has got one of those that he would have to go to work and get a new burner, for instance, if it won't work with 650 B. t. u. gas, if that is the result. And after the company got all through, and the consumer spent money in making the changes, for new appliances, and all that, they would burn about the same volume of gas. There is this about a kitchen range that inevitably from the dust that is stirred up in any room, dust begins to accumulate in the air shutters. If the gas is very rich and needs a large proportion of air, if these are very much stopped up, it is much more poisonous and harmful than if a smaller proportion of air was demanded. In my private kitchen range, we don't take very much care of it, and with a very lean gas, we find these are covered with lint and clogged up and not a credit to a gas man's household, and I often wonder what it would be if we were supplying a richer gas. As to whether the consumers would have more or less satisfactory service after the company had done all this and after we had gone to all the trouble of getting a 650 B. t. u. gas, all the troubles they now have would be magnified a great deal, and there would be necessarily less satisfactory service. Some gas consumers are interested enough in the conservation of their money and other things that when they see their stoves are not working right, they notify the [fol. 661] gas company. Complaints would increase.

Speaking of the 650 B. T. U. and the 537 B. T. U. gas, my assumptions were that if the apparatus was properly adjusted in both cases, and the price remained the same I answered that the consumers would get better service; they would get more for their money. That is the view of it. In making that answer I assumed that the gas coming into the burner of one is 650 gas and coming into the burner of

the other is 537 B. T. U. gas uniformly. That is, that the man has got his burner adjusted for 650 and he is uniformly getting that B. T. U. content. And it remains exactly as adjusted for 537, and he is uniformly getting that content. And it is under those circumstances that one would be getting more for his money than the other. That is the man getting the higher B. T. U. content. The man who is being supplied with 650 B. T. U. gas, or a company that is operating on a 650 B. T. U. standard is not likely to get a uniform standard of heat content at his burner nearly as constant as in the case of the lower heating value. If he does get it constant, he might get more for his money at that. It is an insignificant difference. If there is any difference, it is in favor of the richer gas. He might get a little more, that is my view of it; he might get a little more for his money—but he would be subject in his household, to all [fol. 662] the inconveniences I have mentioned about the clogging up of the air shutter and the incomplete combustion and all that sort of thing. I think in my answer to the original question I said it was not at all in proportion to the heating value.

WING

Recross:

I am not prepared to say what the absolute flame temperature of carbon monoxide is. All the authorities disagree on it. It is very high, and one of the highest of any of the gases. Carbon monoxide has the higher flame temperature by itself. It has a higher flame temperature than methane. All hydrocarbons have lower flame temperature, that is—than carbon-monoxide. Carbon monoxide is a highly ignitable and inflamable gas. Its likelihood of getting through a flame on a Bunsen burner is a very great one. It does escape through the flame. In a well aerated Bunsen burner it does not, but it does escape through a flame. That is altogether dependent on the burner itself, its situation and conditions. I would say it was possible, if the burner was fairly clean and in good condition, that it would escape through a burning flame and remain unburned. That is true in the case of 537 B. T. U. gas as well as 650. If the utensils cover the flame the carbonic oxide escapes around the sides, and if the vessel is cold from cold water [fol. 663] being freshly put in, it is worse. And that is

true whether you burn 537 or 650 B. T. U. gas. Referring to the language of circular No. 23 of the Bureau of Standards, where they say that the usefulness of gas is in simple proportion to its heat content, assuming equal efficiency in the adjustment of appliances, I have said some things this afternoon that are slightly different from that—The explanation that is most obvious is that where perfect regulation and adjustment is made, the tendency is all in the direction as stated there, that it is more useful as it is richer. Assuming equal efficiency in the adjustment of the appliances, that is. You start with an apparatus like that, with 33 to 50 per cent efficiency to start with, not with 100 per cent efficiency at best. The company has no mechanism that produces 100 per cent efficiency in the whole realm or area of mechanics. We have something that approaches, but not clear up to 100, the testing apparatus is the nearest perfect. I could not tell whether Plaintiff's Exhibit for Identification marked 74 was built to utilize 650 feet B. T. U. gas or 60 B. T. U. gas or 537 B. T. U. gas. Referring to Plaintiff's Exhibit No. 75 marked for identification as to what heat content that was built for, I could only [fol. 664] say, being to some extent adjustable there would be a range of applicability, but what limits I do not know. Also referring to Defendants' Exhibits 4 and 5 with respect to the thing that has been called the nozzle in both of those exhibits—so far as these nozzles are concerned any quality of gas can pass through them. Comparing those two nozzles the one more susceptible of adjustment to take care of varying heat contents is the nozzle with the screw cap; it is more easily manipulated. And would have a wider range of adjustment without renewing or changing parts. That is the one that is called the needle valve. I noticed that there were three needle valves on Plaintiff's Exhibit marked for identification—this gas stove that they have produced, the Vulcan stove. I observed also that in the oven there were two so-called needle valves placed. With reference to the volume of the chamber where the mixing is done, the only conclusive inference I would draw was that it was all right for ordinary gas. That is that the size of the air chamber there would take care of a varying degree of heat content of gases so far as that could be regulated by the so-called needle valve. Also an inference would be drawn

that in placing a needle valve at the cock, at the point where they do, they had also supplied the necessary aeration on this mechanism here. That is, that they were all in proportion and proper for the purpose of working as a prac- [fol. 665] tical thing. I admit that in any standard of gas quality whether a 537, 528, or 600, there is as a necessary incident to that standard a varying change in heat content as applied to the consumer. In other words, whether you have 528 or 537 or 600 there is always some variation.

Gas had some effect upon the meters; it deteriorated or wore out the bellows part of the meter. The oil precipitated from the gas had that effect. From my experience in Massachusetts, we have had unusually good fortune and not much trouble. We now have a practice of bringing the meters in every seven years, and there is no trouble.

[fol. 666] You cannot predict that the kind of gas that the Kings County makes, that is 547, would have about that same result. There are different qualities of meter diaphragms and so far as this particular gas is concerned, even at 547, it might have a harmful effect on the meters. In our own case I do not believe that at least once every seven years every meter should be taken in. Our experience shows us that they are good for a longer time. We take them in every seven years, for just the same reason that we test out meters—station meters every six months, to be sure that they are counting the gas. The unaccounted for gas lost by companies I am satisfied personally is almost altogether in the consumers' meters, and even the big variations in the works like purifying, which is quite an important part of the operations, costs only one cent a thousand, and if the price of gas is $1.00 and the meters are one per cent off, there is a big loss right there, as big as there is in what we make quite a great deal of talk about in manufacture. I believe it is good practice to bring our meters in at least once every seven years. A company should do it. It is an error of one per cent which is very significant, and it might be 10 per cent and we not know it. We bring in about one-seventh of all our meters every year. Simply for the reason that we should look them over.

[fol. 667] That is outside of any particular meters that would be brought in because of particular trouble with them. That is our practice. I think it is a very good pol-

icy for gas companies to follow out. Mostly where the meters are good it involves only testing and restamping of the date, and we often send them out for another seven years after doing nothing to them. They generally show up more repairs necessary in another seven years, but we haven't done this but a few years now. We haven't got around to get all on a seven year basis. When we were distributing the very rich gas they stayed out until there was trouble. We are taking them in every *the* seven years with a lean gas like what we are supplying; if a company were supplying 650 B. T. U. gas, we might want to take them in every six or seven years. By reason of high B. T. U. content it is more desirable to do that. It is my opinion that I would not think we could send out as many without overhauling them every seven years as we do now. I do not remember the figures of the expense for each of these meters for repairing them and looking them over. I am not sure whether it would be a quarter of a cent or two cents. I am as vague as that about it per thousand. I know the *the* [fol. 668] expense of taking a meter and testing and sending it back is a dollar more or less.

WING

Re-redirect:

We are supplying a mixed gas up there, partly coal and partly oil gas. As to which is the harder on the meter, a pure oil gas or a coal gas mixture, the water gas degenerates the diaphragm more. Plaintiff's meters need more attention than ours because they are supplying water gas. Not necessarily a great deal more, but that is the tendency.

[fol. 669] ROBERT R. BOGIE

Cross:

I gave an estimate of the additional quantities of material that would be used to make 650 B. t. u. gas in place of 537 B. t. u. gas. We did not produce 537 gas in 1923; we were somewhat above that, 548, as I remember it or something like that. It was at the testing station. It would be

correct to add these amounts that I have given to the materials used in 1923 to arrive at what would be required for 650 B. t. u. gas. Our figures for 1923 were for a 548 B. t. u. gas. Now my estimate was based on producing gas of slightly more than 650 B. t. u.'s at the testing station, in order to have a safe margin above the minimum so I figured on 660 B. t. u. gas, and that makes up the difference in the 10 B. t. u.'s between 537 that I had in this statement and 548 which we really made. In other words we were operating on a safe margin during 1923 and we figured to operate on the same margin for making 650 gas. We would have to. In our estimate of the change in the amount of material necessary here if the company should manufacture 650 B. t. u. gas instead of 537, I estimated that 1.82 gallons more oil would have to be used. In my estimate for the entire amount of oil to manufacture 650 B. t. u. gas, this makes 4.65 gallons per cubic foot of gas made, per thousand. I heard Dr. Wing testify this morning that if we made 650 B. t. u. gas we would have a percentage of residuals of practically 16 per cent. If we applied this percentage to [fol. 670] 4.65 gallons of oil which I estimate would be necessary to produce a thousand feet of gas, the amount of residuals we would recover would be approximately .744 of a gallon. I believe the accounting practice of our company is to credit the residuals produced—at the same price as the gas oil. We pay for gas oil at the present time 4¾ cents. There is an odd fraction in there. Applying that amount to the amount of residuals we would have recovered, we would have a credit of approximately 3½ cents, if I figured that correctly. The amount represented in that 3½ cents would be credited against operations, and also, when the tar was used it would be charged against the operations. Offhand, whether it would reduce the additional cost that I figure in making the 650 B. t. u. gas by 3½ cents, I cannot say. I would have to think that over a little. It would be reduced by the difference between the residual produced and the 16 per cent, providing that estimate of 16 per cent is correct. That is, the residuals produced making a 537 B. t. u. gas in 1923. I believe that was .26 of a gallon. It is one-third of this, something over one cent. My figure is 15 per cent, approximately the same, and also that percentage would be applied to 650 B. t. u. gas against a larger quantity of oil.

In answer to a question of Mr. Moran I said that I believed that all our distributing mains were used by our com- [fol. 671] pany. The streets do not ordinarily have two lines of distributing mains. We have streets with what we call distribution mains and also feeder mains. There is a differentiation there. I could not say positively that any street has two mains both of which are serving consumers, but it certainly is to no great extent. It might be in one or two blocks or something of that sort.

Those Cox stokers are on two of our boilers. In the production part of our company we have thirteen boilers, including the boiler on the dock. Confining my answer to boilers used in the direct manufacture of gas, we have two of those automatic stokers. Two of them are tar-fired; they can be used for oil-firing. That is, two boilers are arranged for firing with either oil or tar. Those could not have automatic stokers, there would be no point in having automatic stokers on them. We have four waste heat boilers. They have no method of stoking, and the balance of the boilers which would represent four boilers are hand fired. The two boilers that are automatically stoked, are 500 horsepower, I believe somewhat above that, and the total of the four hand-fired boilers is 500 horsepower, slightly above, so they are about equal. There is a total there of 2,000 horsepower in the whole plant that is operat- [fol. 672] ing. Five out of seven of our generators are automatically controlled.

I believe at one time our company manufactured and distributed 22 candle-power gas. I have been employed with them since that standard was in effect. I was employed by the Consolidated Company while they were manufacturing that type gas. At the time I was there they did not make any 22 candle-power gas. They were considerably above that. The average B. t. u. content of the 22 candle power gas that was manufactured by the New York Company was between 620 and 640, I should say. I will modify my answer there. That depends entirely on whether it is the gas that was received by the consumer or the gas as measured at the works where it is produced. The gas measured at the works is somewhat higher than that. It would range from 600 up to—I have taken some tests there as high as 680 or 690. I did not personally take any test at the consumers'

or at any testing station away from the works. When I made this estimate of additional quantities and the lesser quantities of material that would be required to make 650 B. t. u. gas, I knew from my own connection with the companies what the approximate condition of the New York companies had been when they made 22 candle power gas.

Q. What was the average amount of oil they used in making a thousand feet of gas at that time, do you know?

Mr. Moran: Well now, I want to object to that. I object to that on the ground it is immaterial and irrelevant.

[fol. 673] I remember at the Central Union Works during the period I was there they were running about 4.6 up to pretty close to 4.8 something over 4.75 gallons of oil to make about 26 candle power gas. In the manufacturing 650 B. t. u. gas there would be practically no decrease in the cost of handling fuel, but—we use less fuel both in the generators and under our boilers. I should not think there would be some saving in the handling of the fuel because it would take approximately the same labor to attend the conveyors, and so forth, and there would be somewhat more repairs on the conveyors. There would not be any decrease in the generator house labor.

[fol. 674] Kings County Lighting Company

Brooklyn, N. Y., March 28, 1924.

ROBERT R. BOGIE

Cross:

Mr. Ward: At the session yesterday, Mr. Moran spoke about a table that had been prepared by the Public Service Commission in 1917 showing the candle power and number of B. t. u's per hundred feet of gas manufactured by the New York City companies. I have a copy of that table that was handed to me by the Engineering Department of the Public Service Commission. If you want it in, I will offer it in evidence.

Without objection it will be received and marked Defendants' Exhibit No. 6.

(Received and marked Defendant Public Service Commission's Exhibit No. 6.)

If our company was manufacturing 650 B. t. u. gas rather than the kind that we are now making, there would not be any change in the repairs to buildings. I do not think it would either increase or decrease, but there would be an increase in the repairs to the gas making machines. Boiler house labor would remain approximately the same. The repairs to boilers would be slightly higher, due to the fact that the waste heat boilers would require cleaning oftener. There would be some change in the amount of drip oil recovered. I figured that change to 15 per cent. of tar recovered. In other words, that includes the drip oil and the tar.

[fol. 675] I testified in the proceeding before the Commission regarding some heating standard tests that we had taken. I do not remember the exact case. I did not hear Mr. Woods testify at that time. Mr. Woods is Chief Engineer of the Consolidated Gas Company. I assume he has had considerable experience in manufacturing gas in New York City. I do not know his exact previous experience.

Based on my experience in the gas business, as to how many cubic feet of gas I believe to be recovered from one gallon of oil in manufacturing 537 B. t. u. gas, that would vary considerably with the grade of oil. Assuming the same kind of oil that our company used in 1923—approximately pretty close to 80 cubic feet I think would be a fair figure for 1923. In figuring out oil efficiency we take a set figure for our cubic feet of oil gas per gallon of oil and let the efficiency figure vary. We use 70 cubic feet as the set figure. That is for general calculations. For computations on the increase of oil and so forth, we use 67.5, because that is the figure that is more commonly used. If we manufactured a 650 B. t. u. gas, I estimated the figure would be about 67½. I have my doubts if it would actually run that high. As to how much blue water gas a pound of generator fuel would make if we manufactured 547 B. t. u. gas, the figures run about something above 25 cubic feet per pound. That is based on an oil gas of 70 cubic feet per gallon. If we manu-
[fol. 676] factured 650 B. t. u. gas, it would be approximately the same figure, about 24—23 or 24. The B. t. u. content of a cubic foot of oil gas will run about 1500 or 1600 B. t. u's per cubic foot. As to blue water gas, about 300 is the accepted figure. A gallon of tar weighs about 8½

pounds. That changes slightly from time to time, but 8½ is an average figure. The weight of a thousand cubic feet of gas would depend on the constituents of the gas. The weight of the finished gas that our company makes, as a rough figure I should say about 50 pounds, that is, 650 B. t. u. gas, the finished gas. That is calculated at atmospheric pressure. The weight of oil gas will run about 60 pounds. I have estimated that we would require 4/65 gallons of oil to make a thousand cubic feet of 650 B. t. u gas. I would qualify that from the fact that I am making higher than a 650 B. t. u. gas at the works. The weight of that 4.65 gallons of oil, assuming approximately 7½ pounds to the gallon, would be approximately 35 pounds—34.875 pounds. You would not make a thousand feet of oil gas with 4.65. You would make 4.65 sometimes 70, approximately. It would make about 326 feet—325 feet. The amount of oil to make a thousand feet of 650 gas would be 34.875 pounds that is that previous figure I gave, that is the weight of 4.65 gallons of oil. We would put in 4.65 gallons per thousand for 650 B. t. u. gas.

Q. Do you know what the experience of the New York companies was when they were making gas of approximately 650 B. t. u.'s.

[fol. 677] Mr. Moran: I object to that. The question assumes a fact that has not been established.

The Master: He asked him if he knows.

Mr. Moran: But he says "What it was when they were making 650 B. t. u. gas. Never——

Mr. Ward (interrupting): I said approximately.

Mr. Moran: Never, so far as I can find any place, did anybody ever make 650 B. t. u. gas.

Mr. Ward: I said when they were making approximately 650.

Mr. Moran: I object to it still. There never was a time under any regulation in any place, anywhere, so far as I can find out, a 650 B. t. u. gas except in this proceeding now, and we are trying to upset it.

The Master: Objection sustained on the ground it assumes a fact not proven.

Defendant's Exhibit 6 shows the average of the B. t. u. content of the gas manufactured by the Brooklyn Union

Gas Company. Evidently it was 636, if those figures are correct, and I suppose they are. The average B. t. u. content of the gas manufactured by the Brooklyn Union covered by that table shows the average to be 636, and the maximum 730 and the minimum 568, evidently for 517 test. I do not know the amount of gas oil the Brooklyn Union used during that period per thousand cubic feet of gas. I am acquainted with the annual report made by the different gas companies to the Public Service Commission. I believe those reports [fol. 678] show the amount of oil used during the year, and the amount of gas manufactured.

The annual report of the Brooklyn Union Gas Company for the year 1917 shows on page 65 under caption 3, the amount of water gas made during that year. The figure is 17,617,817,000 cubic feet.

Q. I then call your attention to page 69 of the same report, caption 49. Does that show the amount of gas oil used during the year?

Mr. Moran: I object to this. We have a distinct issue here, if the Master pleases, as to the cost of making 650 B. t. u. gas. It is directly in issue. And we have put in evidence as to what it will cost to make that kind of gas and how much more it will cost to make that kind of gas than it will a gas of the quality we made in 1923. Now, that issue and that testimony of ours can only be met by testimony of like character and kind, and it cannot be met by some collateral matter of some report of companies in 1917 about how much oil they used to make a certain quantity of gas with, the Lord only knows what B. t. u. content when, as it may apear, daylight tests were taken now and then, and so many things about it, you know: I would never be able to do my client justice if I had to investigate that situation right from that report now.

[fol. 679] The Master: This witness is on cross examination. He asked him his experience and also his estimate for this excess. It does not seem to me that this is proper cross examination upon that, as I have indicated, and I will sustain the objection.

Mr. Hyatt: Exception.

The annual report to the Public Service Commission by the Kings County Lighting Company for the year ending

December 31st, 1917, shows on page 65, caption 3, the water gas manufactured during that year. The figure is 1,232,741,000. On pare 60, caption 47, it shows the amount of oil used in manufacturing the water gas during that year. The figure is 5,018,086 gallons. If you should divide the amount of oil used by the amount of gas made, that would give you the amount of oil, in gallons, used in manufacturing a thousand feet of gas. The average was 4.07 gallons of oil, according to that report, per thousand cubic feet of gas made, and it was 22 candle power gas we made in that year. The figure shown here is 4.07 gallons per thousand cubic feet for the gas made during that year. The plant of our company has been practically rebuilt since that time. There have been new and improved generators put in, and new and improved gas making machinery. The equipment put in was labor saving devices and increased capacity.

In making candle power gas, you endeavor to get the highest illuminating value. The gas certainly has heat when it burns. When the consumer gets it, the heat con- [fol. 680] tent won't be in any relation to the candle power necessarily. The candle power may be steady at 22 candle power, and the B. t. u. content may go up to 700 or down to 550. I mean in 22 candle power gas it would be likely to go down to 550. I have never seen it down that low, but I have seen it down within 5 per cent of that. There is no definite relation between candle power and heat content. You can furnish a candle power gas of 25 candle power without necessarily furnishing at the same time a very high heat content. The heat content of that gas will be higher than if it was 15 candle power, certainly, but as I said before, there is no definite relation between candle power and heating value. Suppose I was examining a 22 candle power gas to ascertain the heat content. I would expect to find a fairly high content above 600 B. t. u. per cubic foot, on the average, however, you might have a 650 B. t. u. gas with no candle power or practically none. You can burn 22 candle power gas on a Bunsen burner without getting any illumination at all. In other words, you can get a very high heat content in your gas without getting candle power. If I had a 25 candle power gas, I would not expect to find a heat content above 650 B. t. u.'s per cubic foot. I would not think that the variation would be above 650 as a mean, rather than below. It might be either above or below. I would say it would be

above 600. In 25 candle power I would not find the preponderance of heat content above 650, rather than below. The most heating value would be below 650.

[fol. 681] I was not connected at all with the Kings County Lighting Company in 1917. The Central Union Gas Company had a testing station in their office which was some distance away, I have forgotten the exact location of it now. It was also tested at the works, to find out what was sent from the works, and there was also a testing station at their works; I have forgotten the address, I think it was 129th Street and somewheres up there. It does not state here where the tests were taken. It just says Third Avenue. It may be the works or very close to the works. The testing station of the Central Union Gas Company in 1917 was at their Central Union office. I have not investigated personally the heating content of natural gas. I know that it ranges around a thousand B. t. u.'s ordinarily, that is on unscrubbed natural gas. There is a difference in the cost of producing 528 B. t. u. gas as distinguished from 537 B. t. u. gas. I should say 528 B. t. u. gas would require less oil, slightly more general fuel, slightly more boiler fuel, than 537 B. t. u. gas. I could not offhand state in percentage terms what that difference would be. I would not approximate it unless I figured it up, and it would take some time. I agree with this statement: "To produce a straight water gas of 528 B. t. u.'s will require 2.82 gallons of gas oil per thousand cubic feet."

[fol. 682] There is no stated efficiency to my knowledge of water gas generators of the Lowe Type, such as we have in our plant at 55th Street and First Avenue. There is no per cent. like boiler efficiency. I do not know of any recognized standard of the Williamson machine. There is a recognized standard for the various kinds of fuels; that varies with the fuels, the operating conditions of fire temperature, of steam and pressure, super-heat, and half a dozen other conditions, temperature of the feed water. In other words, if I were given the type of boiler similar to the type that is used in gas companies for the manufacture of steam, I could estimate roughly if I knew all the factors, about what the efficiency would be. Boilers vary in efficiency from about 50 per cent up to pretty close to 90 per cent. Generators also vary in efficiency. I do not know of

any definite standard of rating them on percentage basis, so that it might be true that the results obtained by the Brooklyn Union Gas Company in manufacturing water gas in generators of the type which they use in manufacturing gas would be different from those obtained by the Kings County Lighting Company. The results might vary in any two different companies, in fact they will vary in any two different machines, generators. I have known of generator fuel results varying 300 per cent. I have known of oil results varying about 50 per cent. at different plants. Ordinarily in manufacturing water gas of the quality known as 600 B. t. u.'s or 550 B. t. u.'s or 537 B. t. u.'s, [fol. 683] the figure of the number of pounds of generator fuel per cubic feet manufactured will range from 30, I should say, up to about 35 or 36 pounds at various places. It depends on the fuel, apparatus used, oil and so forth and various factors, and labor. The amount of boiler fuel in pounds varies; it may run down as low as 5 pounds and again I have known it to go up around 30 pounds. The gas oil required per thousand feet in two different companies, each making 540 B. t. u.'s gas, would not be the same necessarily, it might vary 15 to 20 per cent.

What little coal we have used in the last two years, the ash content has varied considerably. I could not say offhand, whether the percentage of ash was higher in 1922 than in 1923. I think it was higher in 1922. The B. t. u. content of coal that we used during 1922 and 1923 varied, every boat of coal or coke we got in. There is no fixed B. t. u. value, in fact we can not buy coal for that purpose on the B. t. u. basis nowadays. You can get an ash content specification in the contract. We use very little coal at present. I would say the ash content of the coal we use is about the same. These Junkers calorimeters are not recording calorimeters. By merely looking at them you cannot determine the heating content of the gas being sent out. You have to make what we call a test, a check test. We have laboratory to determine the quality of gas oil sold to us and we take a sample from each boat that we get and determine the approximate specifications of it, the quality. [fol. 684] We do not determine the ash content of the coal before accepting it. We cannot hold it up in that way. We determine the ash content of each boat of coal we receive.

ROBERT R. BOGIE

Redirect:

I figured out, the difference in cost of making 1,000 cubic feet of 650 B. t. u. gas at the present time over the kind of gas we are now making—Using the prices of coke and oil under our present contracts. This is a copy of it (exhibiting). That shows an increase in cost of 1,000 cubic feet of gas at the present time—4.99 cents; that is per thousand cubic feet made and of course there is a loss in the distribution. Last year it was about 10 per cent. If you wanted to find out what the difference was in cost per thousand cubic feet of gas sold, you would have to add a percentage to this to find that. If it was 10 per cent that would bring the cost to about 5½ cents per thousand cubic feet of gas sold. That is for those particular items I have mentioned on this exhibit sheet. It does not take in increased repairs to meters or water gas generators or increased stoppages and so forth at services and mains increased work on consumers' prem- [fol. 685] ises due to complaints and several miscellaneous items. This figure at the bottom shows the increased cost of gas made, that is, 4.99 cents. There would be an increased cost on the distribution system to distribute a 650 B. t. u. gas over and above the 537 B. t. u. gas. That would come in where increased repairs were needed, increased maintenance on mains and services, due to stoppages and removing the additional condensate, increased work on consumers' due to the higher number of complaints due to the fact that the utilization of gas is somewhat more difficult than a 537 B. t. u. gas.

ROBERT R. BOGIE

Cross:

This percentage .47 gallons for the increased amount of gas tar is the difference between 8 and 15 per cent. There really is an increased production of tar, but it is a decrease in price. That is why it is headed "Decrease" here, because it is a subtraction from the cost instead of an addition. That is, I estimated the amount of gas oil we had used to make a 650 gas and then I applied to that a percentage of 15 per cent and then I subtracted the amount of

[fol. 686] gas oil required to make a 537 B. t. u. gas. I used 8 per cent on this figure. We did not use the 4.8 that we actually experienced. We used present day figures. Our experience during 1923 showed that we would have a residual of 4.86. I think it was, but we did not use that figure. We used the 8 per cent present day figure that we are operating under. That figure varies somewhat from time to time—difference in oil and we applied 8 per cent to the amount of oil used for per thousand feet last year and subtracted the result of that from our first computation. That gave us .47 gallons increase.

Mr. Moran: This table showing the increase in cost of 650 B. t. u. gas over 537 B. t. u. gas was offered in evidence. Do you want it marked now?

The Master: Yes.

(Marked plaintiff's Exhibit No. 76.)

[fol. 687] ROBERT M. SEARLE

Direct:

At the present time, I am President of the Rochester Gas & Electric Corporation, also consulting engineer and have been in the gas business since 1895, thirty nine years.

I acted as a boiler fireman and I have physically and actually worked in and filled a position in every department of the business up to and including the office of president and selling securities.

Mr. Ward: We will concede Mr. Searle to be an expert on the manufacture and sale of gas.

I began with the Municipal Gas Company of Yonkers, New York; then with the Yonkers Gas Light Company; then with the United Gas Improvement Company; then with the Consolidated Gas Company of New York City; and again with the United Gas Improvement Company; and again with the Westchester Lighting Company; and then Rochester; and in that time I probably have worked in the Atlanta Gas Company, Fort Scott City Gas Company, Jersey City Gas Company, Allentown Gas Company, and then

with the United Gas Improvement Company. My job for a number of years was to get guaranteed efficiencies on water gas machines. Wherever a plant was in trouble I was sent to pull them out. I am familiar with the Kings County Lighting Company. For the past three or four years I have been in constant touch with their entire operation. I know all the officers indeed, favorably. I have been in touch with them, in a consulting way and a directional way. Designed two sets that went there—the layout. Did not design the machines, but designed the layout and the reasons [fol. 688] therefore, and have been in constant consultation with Mr. Bogie and Mr. Bucher for the last four years. They have increased the capacity of their plant in that time, extensively. That was done according to joint discussion from time to time, and then conclusions which I participated in.

My particular hobby has been for years the subject of making B. t. u.'s and how to make a B. t. u. gas, and I have given most of my attention to the gas business, although I began my utility career as Edison's office boy and have been in the gas and electric business a great many years. In 1908 I was, I think, one of the first patentees of a standard Lowe setting for the development of B. t. u.'s. After that I discovered my error that the only future source of raw material and supply would be coal gas, and I devoted my attention to the manufacture of coal gas largely since then, and also a patentee of processes as that which I have sold to the United Gas Improvement Company.

I was one of the originators, with the co-operation of the Public Service Commission of the Second District, State of New York of the B. t. u. committee; was its first chairman, and resigned the chairmanship to go to Europe and make studies of conditions there, and I think we worked together on that Committee six or eight years—six years—doing most exhaustive research work to determine the best gas with the raw materials then available and any future avail- [fol. 689] able materials. I would like to qualify those dates. There is a pamphlet published on it that I could submit in evidence; very exhaustive. I would rather check up the date when the work was finished. Our Committee made a very exhaustive recommendation with respect to the distribution of gas of heating quality instead of gas of

candle power. We made a recommendation as to what B. t. u. content it should have. If I recall correctly—I have not got that before me and have not looked at it in several months—it was 550 and the Commission for the Second District arrived at 585 and they made an order fixing the standard in the territory covered by their jurisdiction as a result of that investigation. Before that order they had in the various towns up there different candle powers, coal gas of one candle power and water-gas of another, and then different city ordinances, or whatever they might be working under, different candle powers; no B. t. u. gas then, only candle-power; gas was first distributed for illumination and it is principally used for fuel now. That is true generally every place, practically, the lighting by gas, is, you might say, gone. To illustrate in Rochester, we are showing something like six or seven times the growth of electric meters to the natural growth of the number of houses; so it shows that the gas business is on the wane very rapidly. Gas is used in the Welsbach mantle. We discourage the use of flat flame burners. I should say that 80 per cent of the illumination in Rochester, or 85 per cent of the total gas consumed is in mantles where it is used for light. I have [fol. 690] examined the reports on the results of the Kings County's operations in 1923. That has been received in evidence here as Exhibits 42 and 49. I have looked up the sheets here the other day at the office and I have checked them up during the year on operations from time to time to check with my work in Rochester. As to the quantity of materials used as shown by these exhibits considering the adverse conditions they are operating under, I consider it the most efficient operation of a plant of its type in the country. In the quantity of materials used as shown by these exhibits, the company has made a splendid record, considering the adverse conditions. Start with the coke—a company of that kind bringing in a boatload of coke cannot take all of its coke to the generator direct, and each time you handle coke to storage and out again, it has a fracture, which produces a certain amount of dust or breeze, and, naturally, there is some handicap there. That is a slight handicap. That can be done otherwise than they do it—only by increased sale of gas and putting more generators in and handling less coke through the yard per

thousand feet produced—handle it right from the boat to the generator. That is done sometimes. The larger the number of machines, the more you would handle direct from the boat to the generator. That is, you would be unloading coal pretty nearly all the time. Any company of plaintiff's size is confronted with the condition that they have, so that is nothing that they can avoid. If it were avoidable, they would have a slight advantage. There is [fol. 691] then the necessity of maintaining two machines for taking up the slack as against holder capacity. There has got to be so much gas made under a given demand, and the machine must be maintained under fire for readiness to serve, and the demand must be met, and it costs money to maintain that machine. As compared with what it would cost if they had an additional holder, I would say that they needed an additional holder. Any adverse conditions other than those I spoke of are: the necessity for speading up the production of gas through their purifying plant to get the gas out under the same peaks. There is some slight disadvantage there. Those are about the important things I think of; excepting some additional labor required who know the machines when the peak demand comes, but that is offset by the criticism I have made. I think they really have got too little labor on the works as an insurance against sickness, flu epidemic, or anything of that kind. In fact, I have recommended more men on the plant. These adverse conditions that I have referred to are all traceable to lack of holder capacity, excepting the fuel.

In reference to my report on heating quality versus candle power that I spoke of first, I think it was March 1st, 1916, and the order of the Public Service Commission is dated October 11th, 1916, and became effective January 1st 1917. I cannot recall without referring to the report. I know we worked years on it and travelled all over and made [fol. 692] thousands of tests. We had hundreds of meetings of the Committee. I have heard the testimony given by Mr. Bogie with respect to change from the kind of gas they have been making to a 650 B. t. u. gas. I would O. K. his estimates as being approximately correct. It is as near as anyone could approximate it. I did not consult with him in reference to that. I saw them after I had done some thinking on it myself. It will take more oil and theoretically

there is a slight saving in generator fuel, and if you increased the quantity of oil per thousand, you are bound to have a very large increase of tar residual credit. The more you put in, the more tar you get, and the further on you go in the reduction of oil, the worse it gets. There is no place to my knowledge where they are making 650 B. t. u. gas that the company might send out to see how it is done. I do not know of any place where they ever did make 650 B. t. u. gas. I never heard of anybody starting out deliberately to make a uniform gas of 650 B. t. u. and I do not think it is possible of accomplishment. We have never made it. In Rochester now we are making about 6,000,000 feet of coal gas and about 4,000,000 feet of water gas, if I recall. I can submit it here. I have got my bag and intended to bring it over. We obtain a standard of about 540—537 to 540. We hug the state standard. There is a state standard now, the Public Service Commission standard of 537. That is an order of the present commission and that is what we are doing. I am in frequent discussion with men all the time [fol. 69] and they are running in the neighborhood of the same value. I have been connected with various plants that made standard B. t. u. gas. The Rochester Company, for instance, and we are doing 540 there now. Prior to that 540 it was higher. It was 585 and I was there then. There was never any company that made higher than 585 gas. That is the limit in my experience—585, that is, making B. t. u. gas. There are many problems confronting a manufacturer of a 650 gas of a high B. t. u. gas that are not involved in a lower heat content gas. Manufacturing first: what happens is this: After many trial and error tests to determine what you are after, as near as you can approximate it, to make that B. t. u., you would put oil in, blast your machine, make hundreds of changes, it would cost you all kinds of money and repairs to determine if you could make a 650 B. t. u. uniformly. You can not make it on any machine. You certainly cannot walk in and just put in oil and make 650 B. t. u. You have got to have a year or two years of experiments, that we never had, and I do not know and it never has been made nobody knows how to make B. t. u. We know how to make 540. We take the raw material, and take what they give us, and that is our remainder, but we do not know how to make it. That is

ah that we are able to use when we make 650; take the raw materials and generate them to the best of our ability, and take what they give us, after much research and trial and error work, there is no standard by which you can work. Our first action would be to blast the machine hotter and put in more oil. We would try that for thirty, sixty or [fol. 694] ninety days, and see what happens, and then from that we would go either back or forward in the heat manipulation, and we would probably readjust our brick and try that out for three or four or five or six months, and see what would happen there, and make comparisons, and if the previous experience was better, we would go to it. If it was worse, we would stick to the one we had. By "we" I mean the operating force of any company—like plaintiff's that would be changing to a 650 B. t. u. standard.

We know that there is a certain increase of B. t. u.'s by adding a certain amount of oil up to a certain point. You take that oil and take what you get, I determine it, and my men give it to me as an estimate. That is the term I use. I agree with Mr. Little entirely. Mr. Little is thoroughly sound on the B. t. u. theory. If he is right in the beginning, he cannot go wrong in the future. As to the problems that arise in operation, in manufacturing, there must be a critical temperature at which the oil would give you the most heat. That is the desirable goal. That could only be determined by frequent and prolonged experimentation, and that brings you right down to: What is oil? That is, is reference made to the oil that Mr. Bogie was fortunate in getting last year, or the oil that he was going to get when you increased the demand 70 per cent here in this Metropolitan District, and they shoot anything to you? Or are you going to take a benzine oil, or Pennsylvania crude, Richmond paraffin base, Michigan asphalt oil, or a con- [fol. 695] glomeration of the two, or any talings from the stills that the oil people are giving? We are at the mercy of the oil people absolutely. They ship you oil. You have got to have it. When we get it as gas oil, we do not know what it is. Last year they padded the gasoline to get a gas oil. There was no market for gasoline. They will probably never obtain it again. That resulted in having a fairly good gas oil. It is a very fine gas oil.

Speaking about manufacturing, you would blast a machine for a critical temperature and try to determine what happens, and what happens is that if you find a critical temperature for a given number of gallons of oil which gives you a certain oil efficiency, you put in more oil, you blast that machine hotter, and you would have three things. The carburetter brick, when they are white hot, give out their heat at a certain rate to crack it, and the latent heat of volatilization as it is cracked into gas takes the heat from that surface. The brick has a certain rate of transmission into that blast. You spray more oil into that, and that vapor oil will only volatilize. If the critical temperature is high enough to crack it into a fixed gas in that volume, the tendency of the higher heat of the machine is to crack other volatile oils into a low B. t. u. gas, the hydrogen being given off and the free carbon being liberated, both in the machine and in the condensate. That cools the machine down and it needs further experimentation to see where you are led to. The reason you go on with another trial and raise that [fol. 696] temperature is to see if you can reduce your tar content. You keep raising your heats until the B. t. u.'s would begin to fall due to the cracking of the large volume of oil. Somewhere in between those two points you strike a balance with a given oil. That is the oil for the run of that particular test. The next boatload of oil may have an entirely different characteristic. Your condensate is then thrown down and the carbon accumulation on the brick, which requires still further blasting and is a poor conductor of heat, upsets the balance given so that the difficulty, the problem of making a gas of high B. t. u. in a water gas machine is very complex. It would be more desirable if you could make a uniform gas of high B. t. u. in a set—the desire of every gas man—because it would cause a reduction in his investment, but he cannot do it and he does not know how. We talk about it, dwell on it, and we have to take what nature gives us in the raw materials. I would not want to make a commitment on how the capacity of a number of generators in a plant like plaintiff's would be affected by a change to 650 gas or whether they would be able to turn out a greater volume of gas in a year, until I ran the machine to find out. They might make more gas, but it might not be the economical balance to a whole plant. It is a very complex question. They might just turn out more volume,

and might turn out less volume. If you had a given quantity of a given oil and had a given fire condition, you would make so much gas—X—. If you were given another oil, [fol. 697] heavier oil, and had to blast harder, then you would have a clinker condition in your fire and make less gas and your capacity would come down due to a confusion of your gas and coke and a longer blasting cycle. If you were putting 50 gallons of oil in, in five minutes for a 537 B. t. u.'s and you were putting 80 gallons of oil in for a 650 B. t. u., trying to attain that, in the same number of minutes, you would have an increased velocity there that would have to be compensated for in some way in the form of heat, and that may be one of a dozen things in the effect on that generator. For those few minutes it would make a greater volume of gas. If you put in 80 gallons in five minutes as against 50 gallons, you increase the velocity. If you put 40 gallons in at a slower rate and you had the critical temperature of those bricks, then you would break it down. If, for the same temperature, you put in more oil to compensate for your fall in your B. t. u. you would have more tar. If you blasted the machine hotter, you would crack up more oil into hydrogen and free carbon and have a bigger volume and perhaps richer in B. t. u.'s but for this minute production you would produce more gas. Not knowing anything about it, I do not know anyone who can qualify on making 650 B. t. u. gas year in and year out, day in and day out, under the legal standard required, that can at all determine the exact effect of the varying oils on a water gas machine. It can only be approximated.

[fol. 698] Kings County Lighting Company

Brooklyn, March 31, 1924.

ROBERT M. SEARLE

Direct:

I have spoken of the difficulties encountered in making a high B. t. u. gas or a high B. t. u. content. There are many problems connected with its distribution, that are not involved in the distribution and utilization of a lower heat

content gas—a great many problems. One of the greatest problems is the menace in its use. Another great problem is the damage to the diaphragms of the meters, and another problem, equally great, is the complaints that it causes and has caused in the olden days, when a rich gas was sent out of variable quality, the consumer not getting satisfactory service—in making a rich water gas or mixed gas. In attempting to make a 650 B. t. u. gas, you must of necessity put in large quantities of oil that cannot be handled efficiently in the set, that make unfixed vapors, which are carried by the gas, precipitated and picked up from time to time, that so changes its richness or B. t. u. content that it is impossible to adjust for it, with the result that carbon is precipitated into the burners, on the utensils, flame area and volume is increased, carbon monoxide is released, and there is no method to my knowledge of controlling it or adjusting for it. By "controlling it," I mean in making a high B. t. u. gas all we know is to put in more oil. That is the only known means of accomplishing that high heat content. [fol. 699] That makes vapors that are precipitated seasonally and due to temperature changes in every part of the works, distribution, consumers' meters. As the temperature changes, these vapors are picked up, the richness or B. t. u. content of the gas varies, the adjustment of the orifice and air is constant and by the precipitation of carbon and the increased flame area due to interrupted combustion, carbon monoxide is thrown off. It is entirely cumulative and is a very dangerous gas to distribute. Illuminating gas has always been made according to some standard, not always a lighting standard or a heat standard. Sometimes prescribed by law or ordinance or franchise. Many companies made anything in the olden times. In the olden times they made just what they got out of the raw material. The larger companies made what was prescribed by the standard stated in the ordinance. In the early days they did everything to get candle power gas that was used for illumination—In the open flame burner, to compete with the electric light. It does not any longer compete with the electric light. Gas is fast becoming obsolete for illumination. It is absolutely, economically and morally desirable that a gas supplied to a body of consumers be of a uniform quality, as nearly as possible of uniform quality. It is a basic

principle that has been aimed for by the gas fraternity, and it is a moral obligation on the fraternity to do this because a gas of a uniform quality, with uniform pressures, would permit of a uniform adjustment of orifice to air supply that [fol. 700] would give a constant area of flame and a safe gas to distribute and be highly desirable. It also means that we can use all the raw materials that are available to use in the future to serve the public economically. If gas is coming out of a jet and I light it, you will not get all there is in that gas, whether it is a rich gas or a lean gas because you can not adjust—O, if it varies, you cannot adjust for a variable mixture. If it was rich gas, high in oil content and condensible vapors, you would get smoke. You are utilizing gas in a jet by just lighting it or burning, it is necessary that you should have that gas come at a uniform heat content rather than at a variable heat content, because you would get a uniform admission of primary air to complete combustion. I am speaking now about its use in a Bunsen burner. That holds good in a flat flame burner. It would hold good in an illuminating burner. They used gas before they used the Bunsen burner. They used it very little for heating. It was used for illumination in the open flame burner. It is largely burned where it is consumed to make heat, in what is known as the Bunsen burner. Ninety-nine per cent is burned in Bunsen burners. If that gas comes in there at a non-uniform heat content, it will give nowhere near as good service as if it comes in at a uniform heat content. If it comes in uniformly—I can illustrate it better with this stove. You have here a hot plate with a given orifice. Plaintiff's Exhibit No. 74—with a given air orifice and a given distance of the burner ring below the vessel's [fol. 701] support. If that were adjusted for a uniform gas, by drilling and a uniform pressure, the area of the flame would be such that the combustion would all take place under the vessel and just short of impinging upon it. If the gas were a variable gas, non-uniform, when it carried high condensible vapors the flame area would increase so that the volume of flame would float out from under the vessel, impinge upon the bottom of the vessel, interrupt its combustion and liberate carbon monoxide and free carbon. This Bunsen burner works on the principle that air makes a mixture, but the purpose of the mixture is to admit

enough air primarily to burn a large quantity of gas in a small space and also assist in complete combustion. Assume that Plaintiff's Exhibit No. 74 was adjusted for 12 feet of gas that is per house of a uniform quality with a uniform pressure, orifice and air inlet, you would have a small ring of blue flame around the burner ring. If you shut the air supply off, to attempt to take all the air supply secondarily, without any primary air through the Bunsen, you would have a very large area of smoky yellow gas that would creep out from under and up the sides of the utensil. The only purpose of a Bunsen burner is to burn large quantities of gas in small confined spaces, relatively large quantities of gas in small confined spaces and that is accomplished by allowing the air to mix with the gas before the point of ignition. In order to accomplish that result which I speak of, consuming a large quantity of gas in a small confined space, there must be a precise mixture; that is, a [fol. 702] certain quantity mixture of air and gas, depending on the heat content of the gas. You cannot have precision results without precision adjustments. That is, you have got to get that mixture right in order to have the largest quantity of gas burn in the smallest space and if the gas varies in its heat content, the quantity of air that is mixed with the same quantity of gas must also vary; that is the theory and the practice of it. I will explain where the necessity for uniformity in gas comes in there.

In this appliance it is highly desirable from the consumer's standpoint, both from the economic end and from the danger or menace of it, to have a uniform gas supplied at a uniform pressure with uniform adjustment. There is no way of adjusting for a variable gas, and the consequence is that it is either precipitating carbon and blackening various utensils under which a Bunsen burner may be used, which results sooner or later in an accident or cumulative poisoning of the consumer using the burner. It is particularly hazardous, as I see it in all large cities, due to the growing use of the kitchenette, poorly ventilated and depending upon gas exclusively for cooking, to use a variable B. t. u. gas. It cannot be made, with present machines, and men available, in any other way but as a variable gas if you make the standard required by the Bill, 650 B. t. u. gas or attempt to make it. Let us assume that last night we had a

holder filled with a given B. t. u. gas after having run a year; say 650 B. t. u. gas, as near as the tests would show [fol. 703] it. Then it would go up, and it might vary 100 B. t. u.'s. If the holder was on the inner lift and went down in the morning, and the sun came out hot, it might easily vary 100 B. t. u.'s. Then immediately at the works they would start to put in less oil to compensate for that, and along came a cold rain at noon and cooled that holder off and it would drop back. It might easily drop back 100 B. t. u.'s and people near the works—it depends upon how far away you are—would have a gas that would vary easily 100 B. t. u.'s in two or three hours. If that happens often enough as it would, water heaters, stoves, Welsbach heaters and others would have carbon precipitated on them and in time the combustion of such a variable gas would be so regarded as to be a deadly menace. You want to bear in mind that if you kill one person that way you legalize murder. That is nowhere near as likely to happen with 537 or 540 B. t. u. gas. It would happen to a smaller degree, but nowhere near as hazardous. The whole business is hazardous, but it would not be anywhere near as hazardous as 650 B. t. u. gas because of the inability to adjust the variable air supply for that variable mixture, and the tendency of the consumer to tamper with the adjustments when the gas does vary so much. Take for instance, the manner of the manufacturing gas. I have cited a lot of horrible instances here, but sometimes those things don't happen, sometimes they happen only very rarely; but take the ordinary day to day work of manufacturing the gas. I wouldn't make one just as uniform as the other because with uniform low B. t. u. gas, say 537 or 540, with B. t. u. gas of 537 you have a [fol. 704] minimum of condensable vapors and a maximum of vehicle to carry the remaining condensable vapors. The vehicle is the carbon monoxide and the hydrogen gas having certain carrying powers for condensable vapors. The vehicle is made in the generator, from water and coal and coke. The only thing that we put in that laymen know about, is the coke and the steam. They produce the gas known as producer gas and that is the carrier that I spoke of. Then we put in the oil which has our condensable vapors and the more oil we put in to the same quantity of coal and steam, the more oil vapors we get in proportion to our

carrying vehicle and less carrying vehicle. We could not get uniformity out of that last mentioned condition not even in the manufacturing of it. The man running the machine will turn out from that machine a more uniform gas if he is using less oil and making what we call the leaner gas. There is no question about the type of man we have running the machine, or whether the machine is automatic or not. It is entirely due to the amount of oil—it is due to the variation in the manufacture, the amount of oil and the vehicle you have to carry it; and then there is another point there that is equally important. In cracking the oil, you can crack a certain amount of oil into a fixed gas, which gives you a certain volume of B. t. u.'s and beyond that you cannot crack oil; it is the hydrogen series and the condensable vapors which load up the vehicle. It is all a question of temperature control.

[fol. 705] This fluctuation in the manufacture of gas would be momentary in the machine, but you have the mixing conditions in the holders. For variations in the machines the holders kind of average it up by letting the gas mix there. That is one purpose that is served by the holder. With this rich gas, when this mixture takes place, it does not result in getting just as uniform a gas going out the outlet side of the holder; a holder filled with a gas highly saturated with condensable vapors, its contents will vary all over the map, due to temperature changes. This morning if the holder was low, for instance, after Saturday and Sunday consumption, it would pick up vapor from the surface of the water in the holder, and the gas would be rich. As the holder went up and the men made their tests at the works, and it showed a high B. t. u. content, the tendency would be to use less oil and make a lower B. t. u. and put it into the holder. At noon, the sun might go off the holder, it might get cloudy and a rain might come on, and then those condensable vapors may drop out—those that had not gone out with the gas during those two or three hours to the consumers—and then the gas would have another content. If you could fill a holder with a given B. t. u. and condense out all the vapors, you would have an approximately uniform gas, but you cannot make a high water gas without making condensable vapors. You cannot get the oil through, and you cannot get the condensable vapors which also con-

tribute to the content, if they are carried to their destina-
[fol. 706] tion. The limitation would be what the science dictates. If you make a 650 B. t. u. gas, you have no control. If you make a gas of 537 B. t. u. and all the condensable vapors are removed, you then have a certain control of it and send out a more uniform gas. You have control with the 537 gas. I should say that the greatest variation then would run 20 or 25 B. t. u.'s either way. That would be the maximum. You can approximate the adjustment of burners to accommodate that variation. With the richer gas the variations would be greater to a large degree. It might easily vary 100 B. t. u.'s. You would not have to have a combination of casualties in order to get that 100 B. t. u. variation. You could have that very easily in the summer. You could very easily have 100 B. t. u.'s. Leaving out the holder circumstance, where the holder gets down low in the morning and the sun shines on it, if you assume an ideal day, which would be 60 degrees and a barometer of 29.9 and if it had been that way all day, the gas would have a certain capacity and the gas would go out and precipitate in the mains, or it might pick up in different parts of the system, where you might find a cold cellar, it would precipitate in the meter, or you might find a warm cellar, where it would pick up in the cellar, making a tremendous variation on the consumer's premises, which is without the control of the company. I said that we might have a variation of 100 degrees. If we were trying to maintain 650 B. t. u.'s it might go down to 550 or up to 750, in the best managed plants and that would results in unsatisfactory service, to say the least. If the burners were adjusted, they
[fol. 707] could accommodate, handle or utilize fairly well a variation of 25 either way from the standard. That can just about be maintained with the 537 gas. The reason for the adjustment in the case of the lower B. t. u.'s, you haven't got the large flame area, due to carbon. Five feet of hydrogen in an open flame burner would give you an area perhaps the size of half a dollar. Five feet of 650 B. t. u. gas would give you an area of about—perhaps 2½ by 2½, perhaps five or six square inches, and that area increases as the condensable oils in the gas are carried to the burner. You cannot get the air either under the burner secondarily or in the primary mixture to complete combustion, and

that is why carbon is precipitated. Lamp black is built up and that forms CO, forming this carbon. The disadvantage of having carbon on the utensil, aside from the complaints of the consumers, who frequently complain of it, is the nuisance of it. It sets up an insulation between the flame and the utensil, it deposits carbon on the utensil and requires a greater use of gas when carbon forms on any utensil. When a flame impinges in such a way that it impinges on any cooler surface, carbon is precipitated and carbon monoxide is liberated, as would be the case with 650 gas. That is that poisonous gas that we have talked about. It is a very insidious, dangerous gas. I have studied that for years, it has been the aim of my life to make a gas that would decrease the hazard or eliminate all the hazards in it, just as they have in the electrical business, which is not as hazardous a business—to eliminate the hazard, to do away [fol. 708] with the hazards in it, but you cannot burn a variable gas in contact with anything, any cooler surface, without precipitating carbon and carbon monoxide. By a variable gas, I mean a gas in which you attempt to make high B. t. u.'s and your only salvation is to pump oil in. That is necessarily a variable gas and the variation is beyond the limits I have mentioned—25 B. t. u.'s either way. In the 650 B. t. u.'s you are doing your level best to put condensable vapors in, in order to get a high B. t. u. average—the most undesirable thing you could undertake. Take this matter of adjusting appliances. Assuming that appliances have been adjusted to accommodate and utilize as efficiently as practicable a gas of 537 or 540 B. t. u.'s and the company was required to change to 650 B. t. u.'s. The best way to go about it if it could be done at all, as a practical matter, would be to make a surgical operation of it, and shoot the B. t. u.'s up and go out and begin to adjust them as best I could, and let it go at that. If I were running the plant, I would want to know what kind of appliances my customers had. I would announce that the company was going to make 650 B. t. u. gas to comply with the requirements, if they could, and that all the appliances would have to be adjusted, that the company would undertake to adjust them as rapidly as possibly and as near as possible. It would [fol. 709] be a very difficult thing to send a corps of men out on Saturday afternoon and fix up the appliances and let

tne gas come on the next day—assuming I had enough men, I would start to make 650 B. t. u.'s to comply with the standard of the Legislature. That is the first thing to do, tell the engineer to make 650 B. t. u gas. It would not kill everybody in the district, but you would have all kinds of accidents and all kinds of complaint. I would rather step it up in moderate jumps, and, during that interim of adjustment, you would have all kinds of accidents. Regardless of accidents, the Legislature says that it has got to be done. The way of doing it would be to go out and change these appliances for 600 B. t. u gas. It would be midway between, and would probably reduce the hazard that is all; but I maintain that there would be a hazard if it would kill one person. If the authorities permitted, I would make two stages. The first stage would be about 620. I would first increase my gas. If you should go on and adjust your appliances for 620 gas—I say 620 gas because I would start with about 600 or 620, I would put out gas of between 600 and 620 B. t. u.'s. Then I would start out and adjust the appliances for it, adjust the orifices, adjust the air mixture and such other adjustments as might be required and, in the interim, of course you would have, as you increased the air, innumerable complaints of gas lighting back, incomplete combustion and the gas lighting here (illustrating with an utensil) which is very dangerous, and is probably the worst condition that you can get, the liberation of carbon monoxide or incomplete combustion due to lack of air. [fol. 710] I am using Plaintiff's Exhibit No. 74 for illustration—lack of air in the orifice. The first thing I would tell my engineers would be to make gas of about 600 or 620 B. t. u.'s. Then I would go out and adjust the appliances to suit that gas, as best we could. Assuming that all the appliances can be adjusted for this purpose, then I would wait a month or two, in order to check up the adjustment, and make another step, go out and begin it all over again. I would tell my engineers to make 650 B. t. u. gas or whatever might be necessary and from then on, I would be all over the district making adjustments. I would have to go out and adjust every one of them. If they were adjusted for 600 B. t. u. gas, they would not be adjusted for 650 gas, and it would be a very scientific and careful adjustment for the higher standard, from 600 to 650 B. t. u.'s. You would

have to be very careful when you got up to 650, and you would have to try and work out the best average on for the appliances. It would be desirable to be done in two stages at least. It would not be a sane operation to try to do it in one stage because it would be dangerous to life.

I know something about gas-burning appliances. I sell them and have been doing that for years. Not all of them in the ordinary community are adjustable. To make these changes we are speaking about the orifice can be reamed and a hole drilled and a brass plug put in to take its place, but that would cost more than the original appliance, to properly handle 650 B. t. u. gas eventually. I cannot tell by [fol. 711] looking at it, Exhibit 74 with my thirty nine years' experience, whether it is adjusted to burn 650 B. t. u. gas. The only way would be to put gas onto it at a given pressure and note the characteristics of the flame and then make your adjustment. Assuming there are a number of these in the district and they are fitted for a 540 B. t. u. gas, and they are burning all right—somebody had the foresight to make them correct for 540 B. t. u gas. I would say to the consumer, if it was his appliance, that the first thing to do would be to get a new one. The cost of changing it would be impracticable because it is a cheap appliance and very hard to adjust. The character of the iron and everything is hard to drill. It could be done on the consumer's premises; it is a question of time. What is called a non-adjustable appliance is one not adjustable as to air shutter or gas orifice. It is a fixed gas orifice and a fixed air orifice. The manufacturer of those things, a supplier of those things, ought to know when a man goes in to buy one—if you went into a store to buy one of those, he ought to know where you live and what standard of gas they were supplying in that territory, but he does not. That may have been bought in Macy's, or Bloomingdale's, or Woolworth's or Rosalsky's. It frequently is bought in a store here to be used up in our territory, where we are serving, about 540.

[fol. 712] Take Exhibit 75, which is the next appliance exhibited here, double fire. If there are some of those on the district that are going into this change, they have got an adjustable air shutter. I do not know whether it is properly graduated—the gas orifice—for a 650 B. t. u. or not. The gas orifice can be reamed—or it can be closed up. It

is a difficult job for a fitter, but it can be done. It is practicable, on the territory one at a time. It is an expensive thing, but it can be done. As to what would be done with that contrivance if you changed to a 650 gas, a fitter would make what adjustments he could, and then tell the consumer that he ought to get an adjustable gas orifice and an adjustable air orifice; but that can be done by a fitter on the job by taking it apart. The consumer is too apt to make the adjustments himself. The consumer will vary this here (indicating) primary, the air shutter. The consumer could not adjust the gas orifice on those things. He would have to take this lock nut out on both sides and then take the burner apart, unscrew the burners and the lock nut, and then either plug or ream this out, and it depends on the ratio of that orifice to this orifice—I do not know, unless it was a matter of tests, what the ratios would be with a 650 B. t. u. gas. He might ream it to give a sufficient quantity. If a rich B. t. u. gas is used in this type of hot plate he would have a long flame here floating out under the vessel, and cool radiant heat from this (indicating). It ought to be red hot. Just [fol. 713] what those adjustments would be I would have to make a test to find out. It can be done, but it is a very extensive, tedious job. There is no secondary air aperture up there right outside of this nozzle that we are talking about; this is an injected nozzle. (Witness refers to Defendant's Exhibit No. 5.) This is an adjustable gas orifice or nozzle which is utilized as an injector to take in the primary air. This is all gas. It is pure gas issuing from this nozzle. Take, for instance, the primary air shutter. You make that larger with respect to the aperture there at the nozzle in increasing the heat content. In order to make that proportion wider as you increase the heat content, you may lessen the size of that orifice on the nozzle and you may increase the size of the orifice or the size of the primary air shutter. That is all involved—either opening the shutter wider to let in more air into the mixing chamber, or shutting the shutter to let in less air, or making the gas orifice either larger or smaller to control the amount of gas that gets into the mixing chamber.

I am familiar with the stove here, one that the company itself sells to its consumers, the Vulcan Cooker 961. That has got a number of burners on it. It can be adjusted for a

high B. t. u. content to a certain point, and it will be out of adjustment as soon as that content changes. I am not sure whether it is possible that that stove there would not adjust at all for a 650. I do not know these dimensions. It may [fol. 714] require on test a change of this spud (indicating). That is a very efficient burner. By the spud, I am referred to the gas orifice, that would be the best way to refer to it. To find out whether this stove could handle 650 gas at all or not, you would take it to the plant and experiment with it by using a 650 gas on it. If you use a 650 gas on it, you would very easily find that although it is an adjustable burner, it did not have range enough to accommodate a 650 gas. (Examining burner.) It would have to be tested out to find whether the air shutter was large enough. This is the finest type of burner there is made. That would have to go through the two stages of adjustment, as well as any other appliance. I noticed the two kinds of nozzles that are on that stove. There are two kinds of spuds, one for the cindering burner, and one for the cooking burner. You might possibly need some new parts for that stove in making the adjustment. I could not say. I have never tested one on 650 B. t. u.'s, but if the man is out on the district now and you are up to 600 gas, or thereabouts, and he fixes it up for that kind of gas, he won't be able to discover then whether it will meet the 650 standard or not. The second time he goes, when the gas is coming in at 650 or thereabouts, is the time he will discover that it may need some new parts. I just want to reiterate the impracticability of adjusting at all for a varying gas of that heat content; a very rough approximation.

Besides the cooking ranges and hot plates and burners of [fol. 715] that sort, there are water heaters and radiant fire heaters and some house heating, I think, through furnaces. They are subject to more or less adjustments, but they are subject to a greater hazard. Take particularly the radiant fire with a variable mixture, you have inability to adjust for it. A man lights a radiant fire and lays down on a sofa; if it goes wrong he cashes in. It is cumulative. He has no knowledge of the art, and to prevent that you have the necessity of a uniform gas. A water heater, with a long flame area due to changes of mixture, varying in B. t. u.'s, rather than mixture, when you vary the B. tu. u. you do vary the

mixture, because you get a richer mixture. The result of that, coming in contact with the water coils, which are continually cooling due to the displacement of hot water and cold water taking its place, is one of the greatest menaces that there is in the selling of gas of a non-uniform quality. Not all of those water heaters have flues. A flue would prevent all that, to a certain extent. A flue on a water heater can plug with lampblack from an improper combustion, and become equally deadly due to the gas filling the room. The whole room can be filled with that. This stove is made to work with or without a flue. The object of that is to get rid of the heat of the oven and the odor of cooking and grease. (Examining stove.) It does not connect with the upper burners at all. That is to get rid of the smoke and grease of the oven when you are roasting—the odor, the heat. Some of the company's gas is used for illumination in the open flame burner. They will get more candle power [fol. 716] if they are in good order. If not, then it would tend to plug their orifices and shut off the flow. In an open flame burner it would give better light—a high B. t. u., because it would have more oil in it.

As to the mantle burner, the tendency of a variable B. t. u. gas is to precipitate carbon when the mixture is rich, on the mantle. That little ball of carbon accumulates and either drops down on the wire gauze mesh at the top and interrupts combustion, or pulls a hole in the mantle, necessitating a man lighting another mantle to get the illumination. The result is he is burning twice the gas, and then that same accumulation takes place on the next mantle and so on, until he replaces his mantle. Mantle burners are Bunsen burners. Not all of them are adjustable. Some of the cheaper ones are built for a constant orifice and a constant air inlet—a great many of them. In fact, you cannot stop the people from buying them at Woolworth's, and different stores. The cheaper type of lamp does not have the adjustable orifices, neither air shutter or gas orifice. If you are using them on a 537 gas, they would not do at all on a 650. You would have your mantle in ruins in a couple of nights. That can happen on an adjustable burner just the same. It just depends upon how the gas flows. As to the principle of illumination through the mantle, you mix the maximum amount of air with a given volume of gas to

get a Bunsen flame, and that impinges on the mantle, makes the chemicals in the mantle incandescent, and also the action is presumed to be catalitic; but it is a very interesting [fol. 717] fact that in a Bunsen flame of that kind, to have a substance maintained at a temperature way above the temperature of combustion of all other things—to maintain its sulphur say a thousand hours without burning up—is a phenomenon known as catalysis. The mantle is heated to incandescence. Theoretically, I presume, the mantle consumes itself and reforms. That is the catalytic action that takes place there; but it does not burn up itself, practically. Barring accident, it will have its own weight at the end of a thousand hours that you started with. The flame temperature has something to do with the mixture there. High temperature gases like hydrogen and carbon monoxide will give a very high state of incandescence, which will also be used in a Bunsen burner. In fact, you could not use any other type of burner than a Bunsen burner to bring a mantle to its maximum incandescence. Assuming that either the Kings County Lighting Company or its consumers, individually or by the employment of mechanics, adjusted all these appliances in the best possible way to consume a 650 gas, or gas of that approximate standard, and appliances that could not be adjusted were discarded and others put in their places, and the company began and continued thereafter to finish gas of 650—attempted to furnish gas of 650; did the best it could to furnish gas of a 650 B. t. u. standard at the testing station—the consumers would not have a more efficient service from their gas than they would get from a 537 to 540 gas. With the exception of perhaps metal- [fol. 718] lurgical work, where it is under skilled control and all of the gas is burned primarily and secondarily in large chambers, the consumer would undoubtedly have a less consumption with a uniform B. t. u. of 547 due to the fact that he was getting a precision adjustment and a nonvarying gas. The effective use is in favor of the low standard of B. t. u. gas. The consumer would use on the average, in the appliances that we have here, less gas in a year at 537 B. t. u. that he would with gas at 650 B. t. u. Under a 537 standard, I do not think the consumers, individually and collectively, would use as many thousand cubic feet of gas as they would under a 650 B. t. u. standard, due to the

fact that you can get the correct adjustment at 537 B. t. u. and the appliances are never in adjustment with a gas of 650 B. t. u. It is because the gas changes. That is why the stove is not in adjustment for the gas. In other words, they would burn no more gas in volume because they would get a more uniform gas of the lower standard, than they would of the higher standard, and efficient results can be obtained only, as I said before, through a supply of uniform gas of uniform heating content. 650 gas has not a single advantage of any kind from any way you approach it. In my opinion between 500 and 540 is the most desirable standard and the basis of that is that you can maintain a more uniform heat content and use raw materials that will give you that result for uniform gas—use the cheapest raw materials.

[fol. 719] There is an immense quantity of gas oil used in the Greater City of New York for making gas. I have checked Mr. Bogie's figures and am in agreement with him as to the amount that would have to be put in. You could not tell exactly until it had been tested out. That would increase the consumption of oil here considerably by that percentage. That is a substantial increase in the demand for gas oil. I could not tell how much of the gas oil of the country is burned here in New York. I would have to check that up. I don't know. It is a very substantial amount. Under those figures between 60 and 70 per cent, the demand would be increased, very nearly 70, but that would be the oil necessary to make the 650 B. t. u. gas at the works. This oil is not plentiful and cheap now, and I am told it never will be. I think increased demand for gas oil will raise the price of gas oil. I know it will have that tendency. I have been told too in the last month that with a shortage of oil we will have to pay more for it. I was told that by one of the greatest authorities in the oil business, Mr. C. M. Higgins. The tendency, we all know, the temptation of the refineries is to crack all of the available oils into gasoline, and this is certainly precluding the possibility of a gas company getting more so-called gas oil, and it is more and more a menace every day. If the Metropolitan District should make an increased demand of 70 per cent for gas oil it would send gas oil up to between 8 and 10 cents now.

[fol. 720] In making that standard of about 537 B. t. u. gas, I said that the standard might be maintained within 20 or 25 points either way and in making a 650 B. t. u. gas the heat content could fluctuate between 75 and 100 points either way from the standard. Assuming that all the appliances on the district were either made or properly adjusted to utilize 650 B. t. u. content, the result if the heat content went up 75 or 100 points would be to form a yellow flame and precipitate carbon and incomplete combustion. If it went down 25 or a hundred points, it would light back in the mixers and burn in the mixers and that does the same thing, it precipitates. As I said, the most dangerous condition that we could have is a mixer lighted back. There is another result to the user that means as much to the user as to the company, because he has to pay for it. In sending out a variable B. t. u. content like that carrying a lot of condensible vapors, another menace is the combustion. The result if the variation was up from the standard would be to smoke up the blowers in a Welsbach or radiant fire stove so that the carbon would adhere to these, "white stilts," is the English phrase for them, and put lampblack and carbon in the water heaters and increase the flame area so that the flame flooded the utensils and blackened the bottom of the utensils and make a heat insulator, and the collateral effect of that carbon is to require an increased amount of gas and a longer use of the appliances to get the same effective use of the heat required by the utensil. In the heater it would throw off carbon monoxide [fol. 721] and be poisonous, and in the water heater it would plug and might easily extinguish the light or cause it to light back in the mixer and compound that condition. In swinging back to the low, your main source of trouble would be the lighting back in the mixers. It is one of the most dangerous conditions you can have. On a cook stove, the person generally gets that kick or pop or odor, even, if it is not working right, and shut it off and start all over and try to light it over again and keep at it until they get it mixed properly, and they always associate the adjustment of a mixer with the yellow flame, and when the burner is lit back, it will burn perfectly shallow here (indicating) and they generally shut the burner off and change the mixer and light it again, and then they still have a yellow flame,

and they tinker back and forth with it and then finally the company is called in to adjust it, and the similar effect of the variable B. t. u. in the mantle lighting is to blacken the mantles, which decreases their candle power, and then the consumer lights another mantle until that probably ruptures. Then with the two mantles going, each blackened, they just double their consumption for light, and the very people who can least afford it suffer that increase consumption, and the weight of these particles of carbon on the mantle pull a hole in the mantle and the result is that they are buying more mantles than they should buy, and I cannot approach it from any standpoint where it has got a single redeeming feature. That is exactly what did happen in the past in putting in lots of oil. Suppose it flashes back, [fol. 722] and the gas burns about the gas orifice in the mixing chamber, it goes out at the other point. It generally lights itself through here (indicating) sooner or later, and burns up around the burner ring (illustrating), with a perfectly shallow flame. If there is no one down there, there is no injury; if there is a baby or a canary bird or a cat down there, it dies, passes out, when it flashes back and burns back in the mixing chamber back here (indicating); it would be giving off a poisonous gas, that is the most dangerous condition. That is carbon monoxide and acetylene from an incomplete combustion. Suppose we take any one of these nozzles here and light one of them—that is a Bunsen burner nozzle with the mixing chamber part of it removed, it will burn gas to a certain degree all right. It will smoke. A large area would not get enough secondary air to permit it to burn completely from a round orifice issuing at that velocity, it would smoke up the end and give off black smoke. It would give off very little carbon monoxide, mostly burns as free carbon, but when it happens in the mixing chamber you get carbon monoxide due to lack of oxygen to consume the carbon monoxide, and due to impinging on a colder surface. The colder surface is around the burner, the iron of the mixing chamber. When the gas is low in B. t. u's for an excess air, you approximate an explosive mixture and then it detonates back through the siphon, the same as on an automobile engine when it flashes back through the carburetter when your mixture is too lean.

[fol. 723] ROBERT M. SEARLE

Cross:

It is true that you very often have a flash back even 500, 537 or 550 B. t. u. gas and that is not due to the fact that your gas has expanded in this venturi tube, so much so that it can not take in secondary air enough to complete combustion and, any flame that burns has an affinity for oxygen, it will grab it wherever it can get it. Carbon, in my opinion, has an affinity for oxygen. You could not get a flame in a partial vacuum, because the minute you have a combustion of gas you have a volume increase of the products of combustion. The tendency of the flame in this partial vacuum would be to absorb oxygen at a greater rate than your ability to do it. It woud liberate—the moment that the consumption of oxygen had reached a certain point, it would start to give off CO—carbon monoxide, and then you would probably faint and die from the carbon monoxide and from asphyxiation due to the lack of oxygen, and then the flame would extinguish itself for lack of oxygen. As to whether the flame would beat you to it, it depends on where you are. It depends on exactly what your hypothesis is and what conditions have taken place, how big the room was and how much oxygen present and how much gas was burning and the condition of your heart and respi-tory organs and so forth.

[fol. 724] On my direct examination I said that I had gone to Europe to investigate the quality of gas furnished in various European cities to make a study of all the process and that was in 1913. I visited London on this occasion. The different companies there were furnishing different gas. The Beckton Company were furnishing coal and water gas. I do not recall now how many B. t. u.'s and the Metropolitan was furnishing another B. t. u., somewhat higher. Other companies were supplying straight coal gas on a candle power basis, on a Carpenter C burner which would mean a low B. t. u. gas, that is, a low coal gas. Other companies were furnishing mostly water gas, but the whole trend of my observation there and the purpose of the study was borne out by what we did in Rochester, and that was to start out and try to get a B. t. u. standard to permit us to use the raw materials available to the best advantage. At

the present time there is some charge over there for the gas according to the number of B. t. u.'s and not by the volume, and I guess it is on a thermal basis, but it is a low B. t. u. gas that is being sold, but the charge is made according to the number of B. t. u.'s furnished in the gas, in what they call a therm, a hundred thousand B. t. u.'s. I think that is right that the Parliament does not restrict in any way the quality of gas used. That is, to a large extent the gas company can pick out whatever quality it chooses to furnish. I am not sure; that is all since the war.

[fol. 725] I am familiar with natural gas. Ordinarily natural gas has 1,000 B. t. u.'s and in some fields as high as 1,350 and when that gas comes to be utilized by the consumer, the heat content is reduced nowadays because in the gas main the condensible vapors are stripped out of it. It used to be sold in bulk. I do not know how low they cut it. I should imagine between eight and nine hundred B. t. u.'s. That would depend on the field. We never attempted to make 650 B. t. u. gas. I have had 650 B. t. u. tests with candle power gas, where we put in oil to get candle power, but as such I never have experimented with 650 B. t. u. gas.

It is true, to some degree, that on a mantle burner you have carbon deposits whether the gas is 537 B. t. u.'s per cubic *feet*, 540 B. t. u.'s per cubic foot or 600 B. t. u.'s per cubic foot, but nowhere near as much as the higher B. t. u. would give. In 537 B. t. u. gas, that carbon deposit is largely caused by lint being taken up against the gauze of the burner. It does not permit the primary air to be taken in. They burn so long without carbonizing, that the air sucks in lint from the room and fills up the tube or gauze with lint. Wherever you have interrupted combustion with any gas containing carbon, you will have carbon deposits. With the 537 B. t. u. gas, with the air adjustment proper, the flame is so short that it does not come in contact with the vessel like it does when it is so rich that it floats. In an open flame burner, the object there is not to get complete combustion, but rather to get a glowing of the carbon elements. You do have complete combustion, only it takes [fol. 726] more time to burn in a larger area, and the flame temperature and combustion of some of the carbon and hydrogen burns the carbon and the hydro-carbon to incandescence, and that in turn gives off light, so that the slower it

burns and the greater the air the greater would be its candle power. Ordinarily if you put a tin vessel or any ordinary vessel on top of an open flame burner, you get a deposit of carbon on the bottom of that vessel. That is due to the fact that the combustion is not as rapid in the open flame burner as it is with the Bunsen burner and that is not true irrespective of the quality of the gas; that is, from 537 B. t. u.'s to 600 B. t. u.'s. It depends upon the amount of carbon in the gas you are burning, and the type of carbon it is. If the gas is composed of napthalene to some extent; then the carbon on the bottom of the vessel, increases very much.

Plaintiff's Exhibit No. 73 is a Bunsen burner. This throat and the burner ring all constitute the mixing chamber in plaintiff's exhbit No. 75 and the same thing is here (indicating), that is, Plaintiff's Exhibit No. 74.

I have described the weather conditions surrounding a holder, that on a bright, clear day like the present day, there was an increase in the B. t. u. content of the gas in the holder, and an absorption of hydrocarbons in the bottom of the holder, showing that by reason of that fact there was a certain variation existing in the quality of the gas furnished on the consumer's premises. That is true to a very small degree in the 537 B. t. u. gas, and to a very large degree with 650 B. t. u. gas. The conditions of the atmosphere [fol. 727] with respect to the moisture and the moisture content of the atmosphere are comparable to the conditions that prevail in the gas in the holder and the ability to hold carbons, that is vapor tension. The higher the temperature of the atmosphere, the more moisture the atmosphere can hold and the higher the temperature of the gas in the holder, the more hydrocarbons can be held, and if there is a sudden drop in the temperature of the atmosphere, you get a certain precipitation of moisture; so also in the holder you get a precipitation of carbons. In both instances they are known as fog and both conditions of the atmosphere are about comparable to the conditions that prevail in the holder with respect to gas. On this question of the variation of the heat content, it is true that in all illuminating gases of whatever quality that are ordinarily burned, you have a certain amount of variation due to these weather conditions that we have described and whatever the heat

content would be—in any carburetted gas it would obtain. It would not obtain in hydrogen. Hydrogen is not so much influenced by that because it has nothing in it to precipitate, however, its ability to hold hydrocarbons as a carrier increases with the increase in temperature, up to a certain point, up to saturation. It has a certain saturation point and you can raise the point of saturation by raising it up to certain temperatures, but for given temperatures then it would not carry any more, just like the atmosphere. You have another element in the atmosphere. You have barometric pressure, and that would obtain in gas, too, if you [fol. 728] had the changeable pressure. I have never experimented with 650 B. t. u. gas but the basis for my determination that there is a variation of about 70 points in 650 B. t. u. gas as compared with this 537 B. t. u. gas which I say has a variation of about twenty either way, is only this, when we made a candlepower gas we had to put in oil to get the candle power and we had these variable conditions, and that is all we know to do today to get 650 B. t. u.'s. We know what the result was then, and my estimate is based absolutely on that experience. That is all we know in the art. I will try to express it in another way. Of course 600 B. t. u. gas on the consumer's premises would have a certain amount of variation in heat content on those premises. Gas having a standard of 600 B. t. u.'s would very easily vary 50 B. t. u.'s either way so that the variation of 650 B. t. u. gas would be about 70 to 100 either way. That is, my conclusion on the fact would be that the more extensive the heat content was per cubic foot in the gas, the more extensive would be the variation. Suppose you had a gas of 450 B. t. u.'s per cubic foot. You could operate within five or ten B. t. u.'s either way. I never examined any data where 450 B. t. u. gas was given to the consumer. That is what they told me was the extent of the variation, 5 points either way.

I have examined circular No. 32 of the Bureau of Standards. Up to the time that circular was issued, I was very familiar with the work of the Bureau of Standards at Washington, D. C. I don't recall exactly what that says, but I [fol. 729] vised the original manuscript at the time that was published. They have made experiments in the manufacture of gas for a number of years, and have tabulated those

experiments. That is a laboratory experiment. In other words, the usefulness of the gas is in exact proportion to the heat content, if the adjustments are correct, I have drawn a distinction between that sort of experimentation, which I characterize as laboratory experimentation and the actual practice of the gas man in the gas works. I don't think their determination is inaccurate. It is accurate, but in practice it is impossible of accomplishment. I know Dr. Rozay and have met Dr. Stratten, both of whom work in the Bureau of Standards.

The Master: Mr. Hyatt read the paragraph from Circular 32 of the Bureau of Standards, to which he has been referred.

Mr. Hyatt: Page 9:

"The importance of the heating value is obvious. Fixed heat is what the user wants, a cubic foot of gas having a heating value of 600 B. t. u.'s will be more useful than one containing 500 B. t. u.'s and if an appliance be adjusted to give equally good service and equal thermal efficiencey in most cases, the usefulness would be in simple proportion to the heating value. However, if the price of the latter were proportionately lower, the 500 B. t. u. gas would do the required work for the same total cost. Thus the heating value is as important a factor in the usefulness of the gas as it is [fol. 730] in the cost of manufacture, and also the proper price to charge for it.'

The Witness: That is right.

That determination is sound. I would not say that if you had been using a gas having 650 B. t. u. per cubic foot and reduced the quality down to 537 B. t. u. per cubic foot, there should be a corresponding reduction in price to that reduction of the heat content of the gas. I do not agree with his determination. He is referring to the price of gas. If it is so much a therm, then he is wrong. That is where the if is in that article. He does not put that part of it in an if. (After reading circular 32.) I don't agree with that. I agree with what he says, but I do not agree with it in practice. The cost of a thousand feet of gas does not follow the B. t. u. content. Its usefulness follows the B. t. u. content, though, that is what I said Friday, that the desire of every

man was to make as high a B. t. u. as he knew how, if he could produce a uniform gas. I make a good basis of differentiation with réspect to this conclusion, because it was laboratory work. I agree also that the men who perform those experiments are thoroughly scientific men. As conscientious, worthy and unbiassed scientific men, they do not endeavor in making those experiments to set up the same conditions in a laboratory as prevail at the works. They work with a 600 B. t. u. and I take that as an assumption. What they did was to determine what a 600 B. t. u. gas would do and then what a lower B. t. u. gas would do, and then find that they would both evaporate a certain amount of water, that is all. They would use a calorimeter, it is [fol. 731] directly proportional, in the laboratory. There is nothing wrong with their science. They do not differentiate between their laboratory work and the results obtained from the actual practical use, that is, they do not say so there, but it is not a practical test in any manner, except that it determines exactly what they state. My testimony would lead one to believe that the adoption of a gas of 600 B. t. u.'s would increase the amount and extent of the variation over and above that of 537 B. t. u.'s per cubic foot. That is what I know will happen. I want to make that clear on the record. This is found on page 21 of the circular, just what I am talking about. "Under present economic conditions the Bureau believe that average heating value requirements in excess of 600 B. t. u. are not justified. Above this efficiency of manufacture will decrease. In coal gas the yield will be low. In water gas the oil requirements will be high and the efficiency of the oil utilization will be reduced. First of all, the gas will be heavily laden with hydro-carbon vapors, which are easily condensed by sudden temperature changes, so that the consumer receives a gas of variable heating value."

[fol. 732] In carbon monoxide, I mean to say that gas manufactured to equal a 650 B. t. u. standard is more liable to give off carbon monoxide than a 537 B. t. u. gas in practical use. Carbon monoxide would escape at any point where gas is in combustion in contact with a colder body, or a pack of air to complete combustion. That would be on top of the burner. Carbon monoxide is not a highly inflammable, highly ignitable gas, in a bath of nitrogen and

carbonic acid. That is a diluent and the minute you bring the complete mixture in contact with a cold body, the temperature of ignition of carbon monoxide is so low, diluted with nitrogen and carbonic acid, that it will not sustain combustion. As a matter of fact, there is more carbon monoxide proportionately to total content in 537 B. t. u., that is, the amount of CO in 537 is greater proportionately than in 650 B. t. u. gas.

Q. So that if what you say is true, that is, that a cold vessel would cause the condensation of carbon and the escape of carbon monoxide, so far as the proportion of carbon monoxide is concerned, the lik-lihood would be greater in 537 B. t. u. gas?

Mr. Moran: Now, just a moment. I object to the hypothesis. It does not propound a question to the witness.

The Master: Overruled.

[fol. 733] A. The carbon monoxide of the original gas is not the cause of the carbon monoxide released by the flame, in contact with a cold vessel. It does not contribute to it, except very minutely. The cause of carbon monoxide in a gas flame is the carbon being incompletely burned in the presence of a cold surface—impinging on a cold surface; coming from the hydro-carbons and not from any carbon monoxide in the gas itself. You would have cold vessels used with 537 B. t. u. gas as well as 650 B. t. u. gas, but you would not have the flame impinging on the cold vessel in that volume. The 537 B. t. u. gas, burning in a small, short flame area or volume, has a tendency to heat the gas ring red hot and to be very short. As the 650 B. t. u. increases in carbon content, the flame volume becomes very large, the flame is cooled, the red hot iron which contributes to support combustion is chilled, and the carbon monoxide is formed from the hydrocarbons, and liberated. All that is due to the height of the vessel above the flame more than anything else. The vessel above the flame ought to be from 1— inches to 2 inches for a 537 B. t. u. A consumer could not correct that by turning down the gas slightly so as to bring the flame to the proper point below the vessel because he would decrease the velocity of the gas through his orifice and decrease the injection of primary air, and it

would result in dissatisfaction and lighting in back of the burner. The available quantity of gas oil for the manufacture of gas by the water-gas method is constantly men- [fol. 734] acing the gas industry, so far as those who manufacture gas by the water gas method are concerned. A man familiar with the gas business, that would cause me to change the art of making gas I would steadily change it to coal gas. I think a strictly up to date plant would have the method of making gas not only by the water gas method but by the coal gas method as well, but it could not with 650 B. t. u. as a standard. I think the time is ripe now for a change in the art, at least to some extent, by installing the apparatus necessary to make gas known as coal gas, but not in the face of this 650 standard. As to coal gas by itself, the best processes would run in the neighborhood of 580 to 570 B. t. u. without being enriched by any gas oil; it would give about 570 to 580. That would depend upon your raw material and that would relieve the gas company of buying any gas oil at all, excepting to make up, perhaps—it might be cheaper to make a smaller amount of water gas of a lower B. t. u. to make up your slack so that if the 650 B. t. u. standard prevailed, it would be necessary for the gas company to buy gas oil. You cannot put oil into the coal gas in the process of manufacture.

I am aware that the Astoria plant of the Consolidated Gas Company manufactures coal gas, and that that coal gas is enriched and was enriched, when 22 candle power was being furnished, so as to bring it up to the heat content of 22 candle power gas. They made a certain proportion of coal gas, which was predetermined by the amount [fol. 735] of water gas they would have to make. It is impossible to make and distribute all coal gas at 650 B. t. u., but nevertheless, they did succeed in enriching that coal gas that they make at the Astoria Plant, and did make at the time 22 candle power as the standard, and they succeeded also in enriching it so as to get the heat content that prevailed in 22 candle power gas and the heat content in 22 candle power gas was at times above 650 B. t. u.'s.

I replied in answer to a question asked me on direct examination, that I never intentionally manufactured 650 B. t. u. gas, but when I was on a 22 candle power gas, I manufactured a quantity of 650 gas. The gas I made at

Rochester was 21 candle power as I recall it, it varied 50 to 60 or 70 B. t. u.'s either way, all over the map. I was working under a 22 candle power standard and was not paying any particular attention to the B. t. u. content. Under the gas manufactured on the 21 candle power standard all of these dire results that I say would result from a 650 gas because of the varying standard most emphatically took place at that time. I maintain that if that menace exists to any degree that it should be abrogated. It does not follow that it is a wholesale slaughter. It is a very insidious slaughter, going on all the time, and it would be more pronounced since the growth of gas for cooking and general use in every home, the use of water heaters in every home and the tremendous increase in the use of radiant fire, all of which has taken place in the last ten years [fol. 736] and has not reached saturation yet. Assuming that the present manufacturing plant of the Kings County Lighting Company was entirely swept away and removed and I was employed as an engineer to design a new plant to furnish the same territory that the Kings County now furnishes, I would not design the same plant as that now used by plaintiff. Assuming that the present plant of the Kings County Lighting Company had been entirely reconstructed and was absolutely new in every particular, in the first year that that plant was used, there might very easily be something over $17,000 of repairs on works and station structures, even if the plant was entirely new, there could very easily be that amount. This is a new plant. Last year this plant in Rochester in our new plant making 3,620,000 for the repairs of works cost $154,054. For the ordinary repairs of works and station structures under the P. S. C. classification it was $25,586. The main items are buildings, painting of buildings, portions of the buildings. It is all in this uniform classification of accounts. I cannot pick the items out without the original entries. There might easily be repairs that would necessarily have to take place on the structures, the actual buildings, within the year. You might blow out [fol. 737] one blower, or you might blow the side of a building out. There are all sorts of repairs in works and station structures. If you assume the buildings burned up, there would be large repairs, but assuming the ordinary course

of business, it might easily come to that. It would depend also on what you have to pay for materials and labor, where you are located, and even that is in favor of Rochester there, and Rochester is a plant that is comparatively new and in good condition, and labor is less in Rochester than it is here. On a new plant the repairs begin the day you start it, but it is not just as much the first year as in the succeeding years. They would go up and down, make a saw-tooth result, one year $25,000 another year $40,000 and another maybe only $10,000. I could not say whether the first year would be as high as succeeding years. I would have to operate to find it out. I would not believe if the holders of the Kings County Lighting Company were new, had just been constructed, that there would be over $7,000 repairs on them the first year, except if you had 650 B. t. u's. There would be in painting. If you have a floating oil on the cups of your holders you have to paint your holders every year, both to preserve them and for public decency. If the holders have just been constructed and painted, you would expect to repaint them again. You ordinarily paint your holders about every two years.

[fol. 738] ROBERT M. SEARLE

Redirect:

With reference to the repairs on a new mains system, compared with a seasoned mains system, I cannot conceive of laying all your mains the first year or a complete plant of such extent as the Kings County is today, but building it piecemeal there would be the succeeding increased cost of repairs as the years went on. Whatever the proportion of the mains system was for the first year and thereafter, and whatever breakages took place in it and other inherent repairs that go with it, it is a big problem. In an estimate of that kind we take 10 per cent for contingencies and then 10 per cent for a factor of ignorance, or what we do not know that does happen. I mean that starting over today anew and not menaced by any standard and knowing what I do today, I would put in coal gas. If I were building a carburetted water gas plant, supposing I was limited to that for some reason or other, I could not improve on the design plaintiff company has down there today. That is

the very latest and best type of water gas plant that they have today. There is none better today. A little more about this coal gas and water gas combination, that is what I meant by my answer that I would put in coal gas and water gas combination. I would compute the territory and the amount of sales and the probable growth of the coke market, and on that I would predicate the coal gas plant, then I would put in a small water gas plant to take the variations in output until we got more demand for gas, and then [fol. 739] I would increase the coal gas. If the same conditions exactly confronted us today, the price of oil, generator fuel and labor, I would build a water gas plant. That depends on conditions. If I was menaced by an increased standard, I would build a water gas plant. If I was sure of my 537 B. t. u. gas I would build coal gas and water gas until I could develop my coke market, and then steadily increase as time went on to coal gas. There is an increased demand on this company's service from year to year, it is growing.

Q. Should that additional requirement be met, in the way of manufacturing solely by water gas installations?

Mr. Ward: I object to that question as immaterial and irrelevant, the future growth of building of this plant has nothing to do with the present case.

The Master: Going into the witness's opinion as to the nature of the plant that should be built?

Mr. Ward: Yes.

The Master: Your point then is that it is simply to reproduce the present plant with the same territory and no growth, is that the idea?

Mr. Ward: No, I am assuming constructing a plant with the same conditions that now exist, not the prospective growth in the territory, or what his knowledge of the oil situation is or anything else.

The Master: Objection sustained. We will confine it to [fol. 740] the present plant.

The Witness: If everything were just as it is, I would build water gas. I would have to. And if I were going to grow and take on additional capacity and could foresee it, then I would build coal and water gas.

You would have to enrich your coal gas, but if I were building anew right now for the 537 B. t. u. standard and no demand, I would build water gas. If I had a growing demand and was building anew and could foresee the future, I would build some water gas and some coal gas.

SEARLE

Cross:

I testified that you would have, if you did not enrich the gas at all with gas oil on the manufacture of coal gas alone you would have a B. t. u. content of 570 to 580 B. t. u.'s per cubic foot. If you have 570 to 580 B. t. u.'s on your coal gas manufactured without enrichment, the ultimate cost of the gas in the holder would be a reason, in my opinion for building a water gas plant. If you started out to reproduce the Kings County new as it is today, with all those conditions that I outlined, of oil and labor, and so forth, you would make water gas to keep your capital expenditure down, because you would have no chance to grow and you would not afford to install anything but the most efficient kind of apparatus for that particular demand. That is the answer to that, which is all reflected in the ultimate cost of the gas. If you had growth, then you could go to coal gas, you could put in coal conveying, and the first cost would be absorbed over a period of years of growth, and it would cost less per [fol. 741] thousand cubic feet of gas over a period of five years than it would if it remained stationary. If you had growth in a plant with coal gas, and you could not meet the demand with coal gas, you would have the added expense of water gas. If you had growth with the coal gas and your coke demands increased, you would have dissatisfied customers and a demand for coke which you could not supply, and then you would probably import coal in order to hold your customers, at a loss to your company. The whole thing is reflected over the ultimate cost of the gas for a period of years, and it is very difficult to say; it depends on whether you are building a gas works for sale over the counter or to run over a period of years. Per unit of heat generated, coke is cheaper than coal, as a domestic fuel. As a domestic fuel to be used in the gas business, it depends—there is coke and coke, and there is coal and coal. Of two fuels of a given carbon content, I would prefer coke,

or of two fuels with a given ash content, I would prefer coke, because you get a certain flexibility. As to whether it is cheaper or more expensive in construction per unit of a thousand cubic feet furnished to build a coal gas plant or a water gas plant, the coal gas plant is nearly double. It would not affect the holders. It would affect the holders of the Kings County Lighting Company if you built a coal gas plant, one of the first necessities would be a large holder to operate economically. I am talking of the present time. They have not got the holder. That is why I said I would [fol. 742] build a water gas plant, because we could get along without a big holder and without all these inherent carrying charges until you started your business. That is what makes it in favor of water gas. You could not run the Kings County Lighting Company as of today on coal gas alone, due to the variation in output, without an extensive capital charge over what it is. Companies that are manufacturing today the gas by the coal gas method, as to whether they occupy any advantageous position as compared with companies that manufacture gas by the water gas method, every one of those we subject to the analysis of each individual site in order to determine whether it is practicable or not. I know it is not practicable with the Kings County Lighting Company, and I know that it would be practicable at Astoria. The Astoria Plant was built about fifteen years ago. The Astoria plant did have a good reason for its existence. I am very familiar with the reasons that underlie the building of the Astoria Plant as a coal gas plant. The first thing they had in mind when they built that coal gas plant was to feel out the coal market and to establish the true cost of making coal gas. They built two competitive units to find out which was the best and, as I recall, they never built any more nor enlarged them, they just got as much gas from them as they could obtain and used the coke to the best advantage and steadily increased [fol. 743] the water gas. I don't know what they have done. Up to 650 I would not attempt to use the coal gas. You could enrich a certain proportion of coal gas with water gas with safety. You could enrich a certain proportion of coal gas with safety up to 650, but just how far I am not prepared to say without knowing the coals you used and what you would get out of those coals. The price of oil makes a

good deal of difference as to whether it is desirable to have a coal gas plant or a water gas plant. I said that it was estimated that oil would go to eight or nine cents a gallon with 650 gas. That would make a difference. Then even on a 650 B. t. u. standard, I would believe in having more coal gas units. That is in the Kings County Lighting Company with some coal gas, a small amount. If you mean all water gas, it depends on how you grow. At the present time you would have to make all water gas, and if you got up to 650, your price would go so high that you would probably try to put in some coal gas plant, to get cheaper coke and do all that you could to make it up to the standard. There comes a time when a rich oil gas is a cheap gas to make. It depends on your standard and it depends on the price of your oil and the price of your generator fuel. Under all the present conditions, 650 B. t. u. water gas would be the cheapest thing, that is, the price of oil. It is like water power; water running down hill might not need any-[fol. 744] thing. There again, it is a question of price and the question of the factors that enter into it, the ultimate cost of a thousand feet of gas. I don't think it is practicable to work in any coal gas at the present time on account of the duplication of capital and the inability to develop the coke market. I am assuming that the Kings County Lighting Company have a plant down there now that is able to manufacture. I am taking the practical situation, not a hypothetical one. Assuming that the entire plant were swept away, that there was nothing there at all, assuming that the standard was to be 537, I would not build any coal gas plant, knowing what I know about the price of oil. I would supply a water gas plant at the present time and then I would wait and see *the* what the result was.

[fol. 745] Brooklyn, New York, April 1, 1924.

A. Gordon King

Direct:

I am Service Engineer of the American Gas Association, 342 Madison Avenue, New York City. That is the office of the Association. The American Gas Association is a

trade association, or the equivalent of a trade association, the membership of which is composed for the greater part of the manufacturers of gas of the United States, representing about 90 per cent of the manufacture of gas. It is a voluntary association. Each gas company joins. I am not sure whether the Kings County Lighting Company is a member of it. I have never looked at the membership list to see, but I believe it is. The association is divided up into sections: The Technical Section, Publicity and Advertising Section, Accounting Section, Manufacturers' Sections, and the membership of those sections, including the Chairman, are recruited from the ranks of the gas industry throughout the country. For this year there are approximately 400 members of the gas industry serving on the various committees and sub-committees. The Secretaries of the Sections are paid men, permanently on the staff—the headquarters staff—of the Association. Each of the Sections takes up the particular work implied by their title; studies the developments of the industry, creates developments, and in many cases does experimental field work on [fol. 746] improvements in the art, carbonization, utilization and distribution work. There is by that means a great exchange of information, which is passed on to the Association headquarters acting as a clearing house, and it is all brought together annually at the annual convention, generally held in October, together with an exhibition of the latest types of appliances on the market. My work consists in solving the problems that rise in the gas business. That particularly applies to my work as Service Engineer. I am not connected with any one of those sections. My job is to answer a very many inquiries of a consulting engineering nature by correspondence, to go out in the field of the manufacture, distribution, utilization, rate-making and so on. I answer inquiries from the gas companies, and from any outsider, too. We answer inquiries from consumers, and we also put the gas company in touch with that particular phase of it. My predecessor assisted a Public Service Commission, Mr. Phillips, last year as an expert witness on heating power standards—the year before last. I have been connected with the Association, since February, 1923, and in the same capacity as service engineer. I was educated and trained for a gas engineer in a manner that

is not done in this country. A gas engineer in my opinion, is a man that has made a long study, very likely a lifelong study, of the manufacture, distribution and utilization of [fol. 747] manufactured gas. We had the ground work of an enginering education to begin with, mechanical and chemical engineer. The training used on the other side, where I received mine, was to serve for three years and three months —three months probation—is what is known as an articled pupil or apprentice to a gas engineer, receiving no salary in that time, paying a premium for the privilege, and following up his technical school work in the evenings and in the day time at special classes, and finally qualifying by passing examinations in gas manufacture and the allied subjects. This three months probation as an articled pupil to a gas engineer—he was the general manager of a gas company, in a plant. It was three years, in that capacity, three months probation. Manufactured gas has been used for something over a hundred years. It was invented by men prior to Murdock, but was first practically made available about 1780, or thereabouts—somewhat over a hundred years. I think it has been used here in New York for a hundred years. Just a little while ago we celebrated the centenary. Dalton and Priestley are the chemists who discovered some of the fundamental laws governing chemistry. Priestley, if I remember correctly, discovered oxygen. Dalton Dalton's Law, Boyle's law was first used in London. Redruth, Cornwall, England, was the first place it was used. After a hundred years experience I think it is, it would be a pretty well established science—the manufacture and distribution of gas. As to the reason they have men like me [fol. 748] now going around helping in the making and distribution of gas there are still some questions of operation about it, questions of handling the products, questions of policy. I am a specialist in that work. I made it my study; try to keep abreast of the times. The man in the average plant has not the opportunity. There are some problems connected with standard—what standard gas should be supplied, and that sort of thing. *There are some problems connected with standard—what standard gas should be supplied, and that sort of thing.* I have a particular connection with that branch of it. I have tested gas for B. T. U., that is, heating value and candle power,

for something over 20 years. I have made special tests on the utilization efficiencies of gases and the design of burners necessary, and, as Gas Engineer of the Public Service Commission for the Second District and Gas Engineer for the Commonwealth of Pennsylvania, that has been particularly within my jurisdiction. I was gas engineer for the Second District Commission of the State of New York, from September, 1919 to April, 1921, and I took a Civil Service examination and am very proud of the fact that I was No. 1 on the list with a percentage of 98 plus. And following that service, I went to Harrisburg as Gas Engineer to the Public Service Commission of Pennsylvania. I remained there for a period from April, 1921, to February, 1923, when I came to New York as Service Engineer of the American Gas Association, of which I have been an individual member for many years—There was a series of [fol. 749] years prior to 1919, from the time of my graduation in 1905. That was 14 years. I served two year- at serving my apprenticeship, as engineer of the plant in Eng land, Gravesend, and then I went to Toronto, Canada, where I was approximately two years, one year as chemist in charge of the laboratory, the purifying houses, the coal testing plant, condenser houses, and one year as assistant to the Engineer during the construction of a new plant. They were making at that time both coal gas and water gas of candle power standard. Then following that Canada experience, I went to the Roanoke Gas & Water Company in Roanoke, Virginia, as a chemist and engineer. Manufacturer's problems, distribution problems, was the work I specialized on there. I went from there to the Brooklyn Union Gas Company for two years, as Superintendent's Assistant at the Fulton Plant, where I specialized in the manufacture of water gas on the regular shift work; took my turn with the men on the old thirteen hour night shift and eleven hour day shift. A 22 candle power was being made there. The maintenance of the standard was also part of my responsibility. And from the Brooklyn Union, I went to the Consolidated Gas Company of New York, in charge of the utilization laboratory, a new development of the company, where all types of gas appliances were tested, domestic and industrial, for efficiency, design, safety, and at that time we carried on efficiency tests on different

heating value gases. That was a period of nearly five years. [fol. 750] Between the time of my going with the Public Service Commission of the Second District, there were six months in the Federal Service on the Mexican Border, and war experience—well I left the company to go into the United States Army, in gas research work, as a United States officer and when I left the army I went with the Selas Company. At the time I was with the Consolidated for a period of five years, I was all that time experimenting with gas applicances, utilization, domestic and industrial, all experimental work. Mr. Fogg was my chief. He was engineer of Utilization and I was one of the assistant engineers. I testified before the Public Service Commission at Albany on valuation work, natural gas problems, and served on a committee appointed by the Commission to study heating value standards and tests. The up-State commission in 1919 had a fixed standard of 585. It was fixed before I went there. There was no candle-power fixed in the upstate section at the time I went there. So I had that experience there with the 585 standard. But when I was with the Consolidated Gas Company and experimenting, the standard covering their territory was 22 candle-power standard. I was experimenting in the utilization of gas. One of the things that came out of that was the development and the decision of what is now known as the Peerless Range, a series of gas ranges that are held for rental by the Consolidated and its affiliated companies and only rented to consumers. We designed in that depart- [fol. 751] ment the burners, after a most exhaustive series of tests. That would handle 22 candle-power gas. I have experimented with the utilization of B. T. U. gas. I do not think I have or I could produce any figures of those tests. There were tests while I had charge of the laboratory in that work. When I was experimenting for the Consolidated in building a range or designing a range, I was designing a range to get the best service out of the gas, under the existing standard. I am familiar with the standards in effect in the different states, and in the different cities of the country. The majority of them are B. T. U. standards. That was not always so. In the early days it was generally a candlepower standard. And it has gradually developed into the heat content standard, with greater

use of gas for heating purpose. When I say heating purposes, I mean using the gas as a source of heat either for illumination in the Weisbach mantle or for industrial purposes, or for the domestic cooking and heating load. In the early days, I mean up to 20 years ago, it was quite generally used for illumination, in the flat flame burner. And there the candle-power standard was essential, because the light obtained from gas in a flat flame burner rests entirely in the candle power value of the gas. The high B. T. U. standard would not give or might not give any better illumination than a low B. T. U. standard. There is no relation whatever. In the mantle burner, though, the heat [fol. 752] is required. It is purely a matter of raising the rare earths, thorium, cerium to a state of incandescence, to make the candle-power with which the mantle is impregnated. There is a base of the mantle that is impregnated with these rare earths. From my experience and general knowledge I would not say that there is required a different kind of mantle for a high gas than required for a low B. T. U. gas, as far as the mantle goes. That is in accordance with my experience also. I think the size of the mantle would have more to do with the pressure, than with the richness. I think I can burn a high value gas and a high candle-power gas and get equally good and efficient results in the same mantle and with a different burner or different adjustments perhaps with the same burner. I would need special parts. That is, I would need a different length of chimney to get a greater draft, to get a better consumption of the hydrocarbons, which require more air for the combustion. But the mantle of itself, its size or its construction, of the mantle alone has nothing to do with the quality of gas that we are using in my judgment. I have been working on that end of it. I do not think there is anything to it. As to what is desired in a B. T. U. gas for efficient service on the premises of the consumer, — is rea- [fol. 753] sonably low, heating value supplied uniformly, absolutely uniformly. There must not be very much variation. The uniformity of heat content is the prime essential; without a doubt this is quite generally the agreement of gas engineers. It is the opinion of commissions. As to the uniformity of heat content whether it be a low or high B. T. U. being so necessary—the consumer must have

uniform service and in order to give him uniform service you have got to supply him with a uniform gas. Speaking of a Vulcan range, whether the gas comes in today at 650 B. T. U.'s and tomorrow at 550 B. T. U.'s and the next day at 500 B. T. U.'s, and as to what difference it makes, the final flame which the consumer uses and which is his measure of efficiency cannot be uniform from day to day or from hour to hour if the heating value of the gas is not uniform basically, because the mixture of gas and air will not be comparable from day to day and will not be able to give the same results. In other words, if I adjust a burner today for 550 B. T. U.'s and there is a change in the manufacture and I get 650 tomorrow, I do not think there is any burner that can adequately take care of that range. You might coin a word and call it elasticity of the burner. That is not sufficient to take care of that big variation and give complete combustion at both times. If it is right at 550, then it won't be right at 650; and if it is right at 650, it [fol. 754] probably won't be right at 550. The burner is one of the things that it has to be adjusted there are other things, such as the pressure and the specific gravity. But that is one of them. Say there is no question as to the pressure here, that we give them any pressure that they reasonably want, and with the pressure and the specific gravity maintained the result is it is adjusted to burn the gas of a certain heating value. And if the heat content of the gas changes, then there should be made the adjustment of the burner in order to consume the gas efficiently. It is essential on the score of efficiency, to have a uniform gas, because you cannot adjust your burners to meet the changes; and there is also the score of danger, which to my mind is the more important. If you have a range properly adjusted for 650 B. T. U. gas and the 650 B. T. U. gas comes into it uniformly, on a domestic appliance I do not think you will get more heat out of it than you would out of the same volume of 535 B. T. U. gas with the range adjusted properly and the gas coming in uniformly. You will on an industrial appliance, but I do not think that holds good with the domestic appliance. For the reason that the overall efficiency or the best type of burner here will be possibly 45 per cent.; and the average consumer in her use of it is inclined to be wasteful, does not turn the gas down when it

[fol. 755] should be turned down and so on. And the test made under those conditions on the district I do not think will show a radical difference between the high—I think the figures were 650 and 550—although it would do so in a laboratory test. That has been our experience right along. And for the reason that the difference in the B. T. U. value is a much smaller change than the relative thermal efficiency. That is, the efficiency of the heat, we will put it, that we take out, compared to the heat taken out by the consumer. I am confining this to domestic appliances. As to the necessity for the essential requirement of uniformity of the heat content, gas can be supplied as a matter of practical everyday experience at a uniform heat content within reason. The high B. T. U. volume manufactured gas 600 to 625, says, and up, is very difficult to furnish uniformly—uniformly to the consumer. That is, within a range of uniformity that would be economically consumed in the burner, more difficult than with a lower B. T. U. standard because the lower B. T. U. value gas is a far more stable gas; it is easier gas to handle out on the district. There is not so much deposition and loss in transmission as there is in the high B. T. U. gas. You cannot make in the process of [fol. 756] manufacture as uniform a gas when you are making it up around 650 as you can when you are making it around 535, because of the instability of the gases, in the components of the gas, which give it that high heating value. In other words, you can make a gas up to a certain point and it will be stable. The extra amount to step it up is a few per cent., a small per cent., generally obtained from the hydrocarbons, and in your case, in the case of water gas manufacture from the oil, that little bunch are hard to hold, and today, for instance, you drop like that the minute they got right around the plant. The gas will lose its uniformity, because those very gases will, in a word, drop. In the process of manufacture you have two causes, one is skin friction, that is the rubbing of them against the walls of the pipe and the apparatus that they travel through—right in the works; and the other is the change of temperature from place to place. Right in the heating chamber where the gas is made. It is always hard in that case to get the higher gas stable on account of the more oil you put in, and if you made a lean gas without any great amount

of oil, that would be stable gas, absolutely, no deposition whatever. And the things that fall out of the gas are those oil substances that you put in to make it richer. And the more oil that you put in the harder it is to hold it as a gas. Speaking of the manufacture, it is difficult to manufacture a uniform heat content where you are striving for a high heat content. After you have made it and sent it out on [fol. 757] the district, to a lesser degree, the same thing will hold good, the skin friction and the condensation. I think a great many engineers lose sight of the fact that a good deal of the condensation in the mains is what we call skin friction on the pipes, and is not altogether temperature change, but both have a very cumulative effect on the gas immediately as it leaves the plant. The depositions along the line, and a change in the quality of the gas are caused by it; that reduces the heat content of the gas. If it is a low B. T. U. gas and anything is deposited, there is not so much tendency for the low B. T. U. gas to have them, because it is more stable. As you get to the lower B. T. U. content, there is less tendency toward that effect. The things that drop out are the ones that give you the heating value or the illuminating value. Then the gas is getting leaner all the time to a degree as it is going from the works. To make a high B. T. U. at the works, say 700, and then let it get leaner as it goes out, it will be a 650 B. T. U. gas when it got out there, but it is rather a vicious circle. I do not think you can tell how much it will drop, and it is certainly not economical. You cannot tell how much it is going to drop, how much it is going to change, so you cannot get uniformity, so to speak, by making it richer at the manufacturing point. I have seen that tried in the candle-power days, and we froze it to see how much it would [fol. 758] drop, and there was no uniformity in it at all. In my opinion you cannot overcome the non-uniformity of that high B. T. U. gas or any other kind of gas by making it richer at the works. I would call a uniform gas probably about 5 per cent either way. That is, it might be 25 below or 25 above. That would be my judgment now after close study of the matter. I would rather prefer to answer that question if I had the information readily accessible as to what is required by various state commissions, because they have been passed on, practically, but right now

I would say 5 per cent. It is feasible to distribute within that range. The lower B. T. U. gas, and certainly not the higher ones. We found in the Public Service Commission for the Second District—I saw the figures for every gas company in the state under our jurisdiction that was large enough to be required to have a calorimeter, which was a 20,000,000 annual production, and we had a number of inspectors travelling all over the state testing with our instruments and not with the company's instruments, the heating value of the gases, and I did not find it as a general rule to be a fact that the gas companies had any difficulty in holding that particular standard 585 within the limits prescribed by the Commission, which I think was 5 per cent. I think they would not have any difficulty with a 540 B. T. U. gas keeping it within that; it would be easier still, the lower you go down, but if you got up to 650, I think it would be almost impossible, to maintain that 5 per [fol. 759] cent. I do not think it could be distributed within that 5 per cent. either way. It would be purely an arbitrary matter of opinion. I do not know of any manufactured gas of that heating value in the country. We have no records at all, and we have records of every heating value standard in the country, the highest we have is 600. It is a state-wide standard in Arizona; it is in the District of Columbia, and while it holds good in Maryland, nevertheless the largest gas company in Maryland has a standard of 500 prescribed by the Commission. They are all for manufactured gas, Washington is also 600. If you went to this richer gas and your appliances were adjusted the best you could, your customers would still be using the same [fol. 760] volume and the same number of cubic feet of gas. Referring to the domestic consumer, I do not think there would be any difference. I think the lower B. T. U. would be a superior service, and not a greater volume. I think this is borne out by statistics or any studies that I have made, or any information that I have been able to gather in over 20 years with the gas industry in three different countries. I have not seen that hold good. That is partly due to the fact that the higher B. T. U. gas does not go into their appliances as uniformly and partly due to the fact that the average consumer does not use gas as economically as it can be or should be used. And, that

being so, then the best thing to do is to supply him with a lean gas. The larger companies have people sometimes called demonstrators, who go around, women in some cases, teaching people how to use gas. The majority of consumers with whom I have come in contact, either directly or indirectly, are doing their own cooking. The cook might turn the gas down when the vessel comes to a boil, but the average housewife in the use of gas is very much worse.

There isn't any shadow of a doubt in my mind, from experience and studies, that the danger, the potential hazard—is very great where the high B. T. U. gas is used, because of the difficulty in furnishing it uniformly and the fact that that very lack of uniformity is apt to swing high [fol. 761] or low above a mean, and when it swings high, we are going to get poor combustion, and poor combustion is going to be accompanies by the formation of carbon monoxide, which is one of the most dangerous products, and that is the things that the gas companies the world over are fighting by recommending and advocating standard specifications for the construction of appliances. If that is a Crane range (indicating exhibit), that undoubtedly is built to the specifications of the American Gas Association, designed to do away with the hazards as far as is humanly possible, in the utilization of gas. There are hazards inherent in a high B. T. U. gas. I do not think I can make it as specific as that to say if that range is a Crane range, it is built to do away with hazard incident to a high B. T. U. gas or a low B. T. U. gas. I used that as an instance to show how the industry is endeavoring to get the very best type of appliances on the market from the point of efficieney and safety. There is poor or incomplete combustion when a gas gets off center. Suppose those burners, were adjusted for a 650 gas, and the company was doing the best it could, but it ran above, so that there was incomplete combustion, and nobody was injured at that particular time, still it would [fol. 762] fill up those holes where the mixture of gas comes out if it got high enough beyond the company's control. The logical thing that would happen would be that there would be insufficient primary air coming through the gas mixing device there, so that the gas burned with a yellow flame on the ports. These (indicating) are known as the ports of the burner. The mixture of gas and air burns at

the ports or holes, and a rich gas, insufficiently aerated, will burn with a yellow flame, and if that condition continues sufficiently long, depositions of carbons will tend to stop up those orifices or ports, forming the carbon monoxide by the heat of the flame against the other carbon, and also liberating unburned gas back of there (indicating), so that both unburned gas and carbon monoxide are quite apt to form. The burner would have to be removed and cleaned, and probable adjusted if that condition were going to continue. I am tal-ing about Bunsen burners altogether here. There are some types of fires known as luminous flame heaters, where the burners are the little old fashioned flame burners. The gas mantle is a Bunsen burner. In the Bunsen burner there is a place for a mixture of gas and air in what we call a mixing chamber, and the adjustment consists of adjusting that mixture and getting the right kin/ of mixture. Generally, we prefer what is known as a fixed orifice, that is, definitely drilled port, and by the way, the majority of gas [fol. 763] appliances today on the market that are good consist of fixed orifice drilling, and in order to deter-ine the size of that orifice, it is necessary that the pressure and the heating value and the specific gravity be uniform, because those are all over this country today, set with a fixed orifice. If a change in the furnishing of the gas at the plant occurs, the combustion is going to be changed for better or for worse, because the "elasticity" of that burner can only go a certain range both sides of the main. In other words, the consumer cannot change the size of the gas orifice at all. If that burner got carbonized and then dirty, it would be necessary, if you were going to continue to furnish that type of gas and the adjustment could not be made of the air shutter, to change the orifice and reduce or increase the size of it. The majority of appliances on the market today that have a fixed gas orifice. In going from a 535 or 540 gas up to a 650 gas the orifice would have to be changed, in every instance. If it was a suitable orifice for 540 it would not be suitable for a 650. It would be too large. It would have to be changed. Every individual installation would have to be changed and adjusted, and between the time of that changing there would be a good many serious things that would be apt to happen. The air shutters are all movable; they can be changed. It has not been our experience

[fol. 764] that the consumer makes a very good air shutter adjuster. They are making a fixed orifice. The air intake has always been adjustable. That must be adjustable, because of the quality of the gas. In other words, the gas industry can design an appliance that will be universally suitable on your district or any other district, providing we know the quality of the gas we are furnishing. I could not tell, looking at that range, whether, even if it were adjusted by a competent man like myself it could handle a 650 gas. We can find out only by test, by actually putting 650 gas in and burning it. This particular range does have, I believe, an adjustable orifice, which would make it a little easier. Some of the cocks have adjustable orifices; this one [fol. 765] would be a little easier to adjust for an unknown gas it is not the type that goes and is safest in the long run, because the consumer can adjust the orifice the wrong way. Referring to Plaintiff's Exhibit 74, no gas company of any repute would give that thing, that range house room or have it on their district. I don't know any word strong enough for the record that you would want me to say. We would not give it house room in a testing laboratory. It is a Bunsen burner. It is not a good appliance because in the first place, a two-piece burner, which this is, is not good practice, because this burner is made in two parts and in the place of ports or small holes through which the mixed gas can burn, serrations occur in the casting, and the mixed gas shoots out at right angles. That is almost sure to produce poor combustion and certainly the formation of carbon monoxide. On account of the volume of metal here, and there, the ring in the center; but worse than that is this casting is not clean and smooth and the throat of the mixing device is very rough inside, which makes a large back pressure, and I think that the orifice which is drilled in the casting itself and is not a concentric with the air chamber and will shoot out at an angle and hit probably the lower part of the mixing chamber, and there is no air shutter at all. I do not think you could see a worse example. This exhibit, marked Exhibit 75, (taking up exhibit) has two Bunsen [fol. 766] burners on it. It is known as a two-burner hot plate. It also has two-piece burners with cast serrations in the top of the burner, it has an air shutter; it is not a particularly good type of appliance. I very much doubt if it

would handle 650 gas, or whether it handles it better than 537 gas. It has not got an adjustable gas orifice. I should say it was a very difficult problem to do from a manufacturing point of view to get 650 gas on our district and have the people all satisfied and have no deaths, and render very satisfactory service, assuming that at the present time we were furnishing a 540 gas. I should say it was a very difficult problem to do from a manufacturing point of view. If you employed me to help you, and if I had to make the change over night, I would have to retain a staff of men big enough to cover every appliance in that one day. Assuming that I was not hurried about it, suppose you give me a reasonable time, whether I increase the heat content first and then go on and adjust the appliances and the other parts, I do not think I could answer offhand, because I would first make a survey of the district and see the type of appliances, and then if that could be done, I probably would set it up at the plant and make adjustments nearly parallel as I could, with a big enough staff to cover the whole district. It could all be set at once from 540 to 650, but I do not think it would be very satisfactory. It certainly [fol. 767] would not be safe. I would have to make two steps in it. I think there would be a great danger. I would have to make a survey of the consumers' appliances. The information I would be seeking by that survey would be the type of appliances and the percentage on my district that could not handle, with any adjustment, the change. The hot plates, that is Exhibit 75, I would throw out. I do not think that could be handled. It would have to be discarded or different cocks would have to be put in there, and I judge the price of those two cocks would more than offset the price of the apparatus. And Exhibit 74, or appliances like Exhibit 74, that have not an adjustable air shutter, or adjustabl- air orifice, I think are dangerous under either gas, they ought to get out, anyhow, and under 650 I think they would be very bad. I think that stove (referring to the one the company handles and sells) could be handled on the district. But I would first experiment with 650 to see what it would require. It might be that I would have to get new Bunsen burners all the way through. I do not know of any advantages in a high B. T. U. gas like 650. Our association did not urge the passage of this law making 650 the stand-

ard in New York State. We were not consulted on it. We did not have anything to do with State laws. We keep out of State laws. We do not maintain a lobby. We made a note of it when it came out. I also personally was asked by [fol. 768] the representative of the Brooklyn Eagle, I believe, over the telephone, for some statements on the matter, and they printed them at that time. I stated substantially but more concisely, more compactly what I have said on the examination here, and ended up with a statement as firm as I could make it, as to the danger in the change and the fact that it was a retrogressive step and against all interests of conservation and economy. As to whether I ever knew of any gas company that had satisfied customers or a high percentage of satisfied customers, or whether there is anything to that thing, about giving satisfactory service, I don't want to hedge on the question, but I have had very considerable experience on interviewing consumers and customers of gas companies while I was steering a middle course between the consumer and the company, as commission engineer, and I think the state of mind of the average consumer, where there is a complaint, is due to a self-*ph*ychology. If one man makes a complaint, there are always a number of complaints from that particular territory. Customers make complaints sometimes based upon reason; they have some grounds for their complaints. I think they would have grounds for more complaints if a company was working under a 650 standard than they would under a 540 say. A great many more would be there. The customers would sort of get down on the company. I do not think it is possible to satisfy them with a high B. T. U. value gas. I think [fol. 769] our lack of uniformity would make it difficult to satisfy them. You would have a large percentage of unsatisfied customers, if your company was trying to furnish that kind of gas. That is not a desirable thing in my experience for a gas company to have. The greatest asset a gas company can have, and I am viewing it largely from my experience as a commission engineer, is a good public relations spirit, which comes about by their getting good satisfactory service. That is a valuable asset to a gas company, so valuable that it has a dollars and cents value in a rate making case, under going concern value. It is generally in there, at times, and in some manner, and where it

exists the rate case very rarely comes. Sometimes customers also report the company to the Public Service Commission when the company is not giving good service. If the company is not giving good service, if something goes wrong with the stove, the company has got to send a man out to fix it up every time. It has a value in that way. If the customer is satisfied, he does not complain to the company, so they save the time of the man going out. It has a dollars and cents value right there. I have seen some cases of that kind where the customers hold off payment of their bills because their service was not satisfactory. The Company's operations would require more working capital if you have more unsatisfactory service. I have prepared a list showing the details of standards in other states which was compiled by the headquarters of the American Gas [fol. 770] Association through, or, rather, with the Heating Standards Committee of the Association. The material for this was furnished by the Public Service Commissions, and it was compiled a few days ago in this form. It gives the heating value standards in several states. It does not give them all. It runs from Arizona to Wisconsin, but there are some missing, I notice. These (witness indicates on list) are the standards adopted by the State Commissions. The legislative acts are not included on that. There is no legislative act to my knowledge in any other state except this State of New York. I am quoting from another list. It was not definitely fixed any place to my knowledge by an act of the Legislature. The only authorities prescribing calorific standards of which I have knowledge are those prescribed by state commission for statewide adoption, for adoption in specific cities of a state, or those prescribed by city ordinance or city authorities. I have no records of [fol. 771] any being prescribed by the legislatures. I know that 650 is here in New York. And I know that it was a 22 candle-power standard before. This paper that I produced first shows the heating value requirements in the states mentioned according to the records of our organization. I use these in my daily operations and find them to be as stated here.

Mr. Moran: I offer that in evidence.

Mr. Ward: I object to it as irrelevant and immaterial, what the standards are in other states. I am not objecting

to it on the ground that it is not an adequate statement of what it is in those states. I do not want to raise that question; but I do object to it as irrelevant and immaterial.

The Master: Overruled.

Mr. Hyatt: Exception.

Mr. Ward: Exception.

The Master: It will be received and marked Plaintiff's Exhibit 77.

(Marked Plaintiff's Exhibit No. 77.)

These are the records of all the states where the commissions have adopted a standard.

[fol. 772] Mr. Ward: And the reason that some of the states are left out is that there is no standard fixed by any public regulating body in that state?

There are one or two curious things about that, that the question leads to. For instance, the State of Georgia has no statewide standard prescribed as such. Nevertheless, a large number of cities in Georgia are all furnished with 575 B. t. u. gas on an average and prescribed as a special standard by act of the legislature by the state Commission. I have some information concerning the local standards and I have that tabulated (producing witnesses' paper).

City Calorific Standards prescribed in certain cities that are not covered by the statewide standards covered in the previous exhibit. In other words, they are special standards prescribed by the Public Service Commission of a state or by franchise, which I have covered as City authorities, marked as "Asterisk 1" following each standard. On the third page there is an explanation of the asterisks. When the state commission of a certain state fixes standards for different cities, not by a statewide order, but for cities, they do not necessarily give the same standard in all the cities where they fix it. Frequently that is due to the recognition by the Commission of the fact that the particular process of manufacture adopted by the company in question calls in the interest of economy for a different type of standard from his neighbor. I could not say as to [fol. 773] whether they might leave a company with its standard, to obviate the necessity of adjusting appliances.

I am not able to state the motives that actuate the Commission in fixing standards.

Mr. Moran: I offer that in evidence as being a compilation.

This is used by our organization. It is used by us in very many ways and largely used by appliance manufacturers who wish to know the heating value standards in the territory in which they are selling their product.

Mr. Ward: I want to object to it as being irrelevant and immaterial, and if it proves anything, it proves that the state has a constitutional right, either acting through its Legislature or through a body constituted to regulate its utilities, to fix the standard for gas companies in the state.

Mr. Moran: I stand on my offer.

Mr. Hyatt: However, the same objection.

The Master: Same ruling.

Mr. Ward: Exception.

Mr. Hyatt: Exception.

The Master: It will be received and marked Plaintiff's Exhibit No. 78.

(Paper marked Plaintiff's Exhibit No. 78.)

There is one city on that exhibit which is not included, the city of Denver, Colorado, which is furnishing a B. t. u. value 400, measured at normal temperature and pressure, because of the difference in elevation, so that is comparable [fol. 774] with all the other B. t. u. volumes—400, and that is the most recent order of a regulatory body, and by that order the gas companies in that state, Colorado—may declare the B. t. u. value they will furnish and Denver is one of the first to take advantage of the new order and furnish 400. The Public Service Commission of Colorado has made it optional with gas companies as to what standard they will supply. It reads, "Each utility supplying gas for domestic or commercial purposes shall establish and maintain a standard heating value for its product, which standard shall be the monthly average total heating value of the gas as delivered to consumers at any point within one mile of the manufacturing plant or center of distribution. This standard heating value shall be that value which from its

experience the utility finds most practical, economical and efficient to their satisfaction." That is an order decided August 29th, 1923. I only have one copy of that.

Mr. Ward: I move to strike out all the last testimony and the reading from the order of the Colorado Commission as being irrelevant and immaterial in this case.

Mr. Moran: You do not question the form of the proof? We have a copy of the order here.

Mr. Ward: No, I am not going to make you go to the trouble of showing all that.

Mr. Hyatt: You are not going to put that all in evidence, are you, Mr. Moran? Human nature in Colorado is the [fol. 775] same as it is here.

The Master: Overruled.

Mr. Ward: Exception.

Denver is the only one that I have knowledge of, and that is supplying a B. t. u. gas of an average of 400. I do not mean to say that 400 is the same in Denver as 500 is here. I said 375 in Denver is equivalent to 400 here. Actually 375 measured there, corrected for normal temperature and pressure conditions, due primarily to elevation, is about 400, as compared with any gas in this territory. 375 B. t. u.'s and that is the same as 400 here. As to 375 B. t. u.'s being the same as 375 B. t. u.'s here, it is a case of measurement. It is the equivalent of 400 here. As to what temperature water boils out there, it is better to figure. 375—the figure 400 should not be used, because it is misleading. For engineering purposes there should be an understanding that that is corrected and is equivalent to conditions here under normal temperature and pressure. I don't know whether it costs a person — much for fuel in Denver for cooking as it does here.

Q. Before I terminate my examination, I want to give you any opportunity to make any corrections that you desire that the circumscribed nature of my questions might have led you into making.

A. It would be difficult to go back without seeing the testimony.

[fol. 776] There is only one possible way or place where a high B. t. u. value is of value to a consumer, in my opinion,

and that is to the industrial consumer, and that is weakened by the fact that gas is a competitive fuel, competing with oil, electricity, gasoline, and other sources of energy, and it automatically rules itself out.

The majority of gas is used for domestic purposes, and a small percentage for industrial purposes, and it is that very small percentage of industrial consumers that might get a greater advantage by virtue of a higher B. t. u. value gas, for reason that, it being a competitive fuel, the appliances in which the industrial gas is burned are the very finest and most efficient it is possible to use or to make. It can give no advantage whatever to the domestic consumers. Certainly not to a company, or to the consumer. It is reverse in my experience. I know the Fourth Ward territory in Brooklyn fairly well, have been over it, through it.

KING

Cross:

Referring to those figures in plaintiff's Exhibit No. 78, with exception of Michigan they are contained, many of them, on the answer to questionnaires sent to companies furnishing gas in that territory. Michigan we received from the Michigan Gas Association. That is the exhibit that [fol. 777] deals with the standard prevailing in various cities, the information comes from the companies who furnish gas in those cities. I could not say whether the communication or the questionnaire was directed to the city authorities in any case. Those figures are compiled in cards, in a card filing system, a record such as this, which is the original of this material. Most of the companies are member companies of our Association. That is our source in these rate cases.

I personally made up Exhibit No. 78 and had the assistance of a stenographer. The particular checking on this exhibit, between my original material which I checked and the stencil, I did not do. That checking was done by our stenographic force. The original I have in my hand is checked on every standard and shows a red pencil check as to its accuracy. I made that check personally. That original was checked in some cases with the original answers to the questionnaire about which I spoke. In others it was

checked with cards made from the original questionnaire, which were checked by my predecessor Phillips.

I made up Exhibit No. 77, plaintiff's. The information regarding that came from the Commissions themselves—that is, there was a questionnaire directed to the Commissions, and their answers were received.

I also compiled indirectly Plaintiff's Exhibit No. 77 from those answers. I had previously compiled, with the assistance of our headquarters staff and our committee a table [fol. 778] showing all that appears in Plaintiff's Exhibit No. 77, as a consummation of the sections applying to heating value, the requirements of the various Public Service Commissions that appear thereon.

Referring to the compilation that appears on that particular sheet of Plaintiff's Exhibit No. 77, I had the assistance of a stenographer. I made a check with the original records containing the answers from the Public Service Commission that appears on that sheet at that time, and I found them to be correct.

The center of Plaintiff's Exhibit 74 is a Bunsen burner. From the orifice to the combustion ports is a standard Bunsen burner. My answer is based on the fact that it has a mixing chamber at this point; and also on the fact that it has an air inlet, together with a small orifice for the inflow of gas; and further that the gas flowing in can entrain a certain amount of air to complete the mixture which will be burned with a blue flame at the burner ports. If there is not perfect combustion it will still be a Bunsen burner, although a mal-adjusted Bunsen burner. It is not my understanding that the essential characteristic of a Bunsen burner is that it is an adjustable burner, to insure complete combustion of the gas used. The ordinary Bunsen burner, such as that used in the laboratory, is made of brass and [fol. 779] iron. It should be a very smooth surface on the interior. Not always has it a sliding shutter at this point to let in the air. I have seen them without. I have seen Bunsen burners in laboratories not having a sliding shutter. A sliding shutter is preferable because the more control you have over the burner the more satisfactory service you have. But a Bunsen burner primarily has an air shutter in order that you may get an oxidizing flame or a reducing flame in chemical reactions. The whole interior

surface in the mixing chamber of a Bunsen burner should be perfectly smooth, so as to avoid what I call skin friction. I think I only applied the term "skin friction" to gas manufacturing. The smoother the interior the better the mixture. The burner ports are at right angles to the mixing chamber ordinarily, and the flame burns at right angles with the mixing chamber ordinarily in domestic appliances. There is a cylinder on any Bunsen burner used in a laboratory for laboratory purposes, about the size of a lead pencil in diameter. The customary Bunsen burner is the vertical tube burner; there is a cylinder that fits around it, but I never saw one at the top where the flame issues.

I see a minor mechanical difference between Plaintiff's Exhibits Nos. 74 and 75 with respect to the air entering the mixing chamber; but basically there is no [fol. 780] difference. It has been the equivalent of an air shutter and Plaintiff's Exhibit 74 has not that movable slide. The Bunsen burner, as conceived and used in the laboratory, has not always and necessarily a movable slide; it has that slide but for a different purpose. It is possible for me to design a burner for a specific gas of a uniform system that will not require a movable air shutter. Suppose you have a gas that varies in the heat content and you want to insure perfect combustion, you cannot use that Bunsen burner that has no shutter. You would require an air shutter, but the point I am trying to make is that there is no comparison between a laboratory Bunsen and this Bunsen burner for the reason that a laboratory Bunsen is designed that way specifically for work on a tripod or on the combustion tubing and it is necessary sometimes to get a reducing flame and sometimes an oxidizing flame and therefore the air shutter is essential. It is true that that type that I now described is used largely in laboratories that utilize ordinary illuminating gas for purposes of experiment. The air shutter is used for the purpose of taking care of the varying heat content of the gas used.

I have evinced some familiarity with the apparatus used in industrial concerns in burning gas and characterized that apparatus as the most perfect form of apparatus. I [fol. 781] would not in my judgment classify the use in hotels as industrial. It is a classification that is sometimes

made but ordinarily the distinction is domestic, industrial and commercial. I had in mind when I said it was the most perfect type of application to be used, the heat treatment of metals, the melting of soft metals, the melting of brass and similar industrial appliances where the burner is designed specifically for the job, for the furnace, and where the pressure and the mixture are controlled by mechanical means. In that industrial purpose that I have described it would depend entirely on the pressure that we are going to distribute at or the gas mixture, what sort of cock is used. Defendant's Exhibit No. 5 is used for industrial purposes. It is not ordinarily that kind of orifice that is used for industrial purposes—that is an adjustable orifice. It is used in small candy manufacturing and such things. That is Exhibit No. 4 (Defendant's).

In the industrial use of gas appliances they do not always have a type of orifice that is adjustable for the heat content. Each job is decided upon its own specific merits. I could use those on some industrial jobs but not many.

Defendant's Exhibit No. 5 is not a needle valve; it is an adjustable orifice. I think some people would call that a needle valve, but my conception of a needle valve is one [fol. 782] with a needle. It is an adjustable orifice. A needle valve is nothing more than an adjustable orifice, that is of different construction than the type before me as an exhibit. It serves a different purpose—for regulating the amount of gas that can flow. If the plaintiff were to actually adopt 650 B. t. u.'s as its standard and put it into force and effect on its territory and change its appliances accordingly, I do not think that would necessitate changing the pressure to some extent on the district. It would be necessary to make that orifice smaller if the quality of gas was raised from 537 B. t. u.'s to 650 B. t. u.'s. The principle is just the same. This spud can very easily be withdrawn from the cock. It cannot always be so easily removed on a range in service as it can in the one here (indicating). Those that have been long in service and got too tight they will sometimes be destroyed in the removal. That type of [fol. 783] spud cannot easily be so adjusted. It is necessary quite frequently in that part of the gas stove known as the Vulcan range, even with 587 B. t. u. gas, to clean the burners in order to remove the grease droppings and dust,

and also to remove a certain amount of carbon around the orifices of those burners—the places where the jets of gas issue. The carbon did not come from the gas, it came from the dust and droppings from the cooking, etc., that is carbonized. Even in the 587 B. t. u. gas when the gas comes through and gets on a cold surface, there is no danger or likelihood of the carbon elements in the gas carbonizing on these interior surfaces here in the burner. I do not think I have said that in going from 537 to 650 B. t. u.'s it would carbonize. If I have been so understood as saying it would carbonize at 650 on the interior surfaces of those burners I have not intended to convey that. There is no carbonization, as I understand it, inside the burner at any time, and any carbonizing that occurs will occur on the ports from a rich gas that cannot be adjusted in that particular burner automatically or by hand. I do not know how this burner will burn now. I would have to make an actual test to ascertain that, and my test would depend upon the appearance of the flame and also upon its height. I would adjust it to the [fol. 784] point where it was just short of flashing back into the mixing chamber and that would give me my maximum efficiency and shortest hardest flame. Then I would bring it up until it was softer than that, so the consumer could use it for the full range of the gas supplied, turn it up and turn it down, subject to drafts in the house. A proper size of flame necessarily involves an adjustment with respect to the appliance to be heated. Those factors are tied in so close together that it is difficult for me in this type of examination to separate them without some contradiction. I find no difficulty about adjusting a burner to burn 650 B. t. u. gas. Suppose the plaintiff were exclusively manufacturing gas that was produced by the coal gas method, there would be a loss by reason of deposition of hydro-carbons, causing a reduction in the quality of the gas, notwithstanding there was no gas oil used in the manufacture. Whether or not there is gas oil used in the manufacture of gas there is a certain amount of condensation in the mains; with the proviso that I am making mentally, or have in mind, rather, a relatively high value gas. Ordinarily coal gas has a B. t. u. content of about 680, without enrichment. I would not say that was an average. It can be done, but it is not average [fol. 785] practice. I am not in a position to quote the

average practice, and I would not care to rely on my memory, but it is not usual, with these days of demands on the plant, and so on, and on the score of economy, to manufacture a very high B. T. U. value coal gas; but I am not prepared just now to say what the average B. T. U. value coal gas manufactured is, without reference to notes or records. I was in London in 1907. My training in my profession was twenty miles outside of London. Both coal and water gas are in manufactured gas in London. I do not have with me the percentage of coal gas to water gas manufactured there in point of number of plants, or in point of volume. I could lay my hand on them in my office, but I could not quote them. The larger proportion of a mixed gas where mixed gas is used, and that is very considerably in England, is coal gas. The reverse is true in this country, but it is primarily due to legislation, I think, on the other hand, and labor conditions, oil supply and so on, other causes, other contributing factors. We have the B. T. U. standard prevailing almost altogether. A therm is 100,000 B. T. U.'s. The charge made to the consumer is all on the basis of the number of [fol. 786] heat units furnished. That is, the charge, is made on the therm and the fractional part of the therm that is used by the consumer in a given period of time. Essentially the charge is on the basis of the heat units given per cubic foot. My own particular practical experience in England ceased in 1907. I have done some experimental work with varying qualities of gas since I have been in this country, and I have kept track of records of tests made by others. I have never done any research work in the Bureau of Standards at Washington. I have followed the research work that they carry on and conduct. I think the research work carried on by that department of the Government is to be relied upon, but before I would answer that question so generally, I would want to study a particular problem, because in my judgment it is the interpretation of data rather than the accuracy of the work that is important. We do not [fol. 787] always see eye to eye with some of the Governmental people in Washington. That is, two scientific men may not draw the same inference from the same state of facts. That is one of the things I mean, and the scientific man will draw an inference that the practical man in the gas business cannot apply to his business. It very often

happens that the scientific man may discover something in the gas business that is very practicable and useful to a practical gas man. In a gas of 537 B. t. u.'s per cubic foot, or less I do not think there is more carbon monoxide than in a gas of 650 B. t. u.'s per cubic foot or less. It may be that the proportional percentage of carbon monoxide to the total gas is greater in 537 B. t. u. gas than in 650 B. t. u. gas. I do not see that it is necessarily so. By and large, we, as a gas industry, are not so much interested in the dangers of carbon monoxide in the gas prior to combustion. It is avoidance of carbon monoxide in the combustion of the gas that we are interested in, and that is the reason we talked about specifications, types of appliances, etc.; not because of the carbon monoxide beforehand, for we don't want the gas to be used or released unburned from the works to the appliances. I do not remember what the flame temperature of carbon monoxide is. I assume it is probably around 3,200 degrees Fahrenheit, but I would want to check that up, and [fol. 788] I know what the flame temperature of methane, which is another constituent of illuminating gas, is. I could not quote those figures. I would want to refer to them. I am not relying on memory. I would say that methane was probably the higher, but it is absolutely soft judgment. I do not know and I want to check it up. I do not think I conceive flame combustion quite along those lines that if methane had a higher flame temperature, it would very likely ignite the CO. Here is hydrogen, methane, carbon monoxide, some CO_2—very slight—issuing out of a gas flame, the gases having a higher flame temperature than CO. They might ignite it. We do not conceive of any possibility of carbon monoxide escaping if the burner is correctly adjusted. My general tren- of testimony was that a burner adjusted correctly for a given B. T. U. value of gas and giving off no carbon monoxide will quite readily form carbon monoxide if the quality of the gas is changed and no adjustment is made on the burner. It won't escape. It will be formed. It will poison people, if the cumulative effect of it is long enough. In the products of combustion, normally the products of combustion from a gas burner are carbon dioxide and water vapor, which are both innocuous and are both products of combustion, of our own breathing system. We get rid of some CO_2 every time

[fol. 789] we exhale. My point was the fact that a change in the quality of the gas will mean incomplete combustion, and therefore the carbon dioxide is formed in two stages of combustion. First of all, the carbon monoxide and then carbon dioxide. And we will not have complete combustion if a change in quality occurs which is beyond the elasticity or the elastic limits of the particular burner we have in question. In other words, what I have said is analagous to the situation of a coal fire burning in a furnace; that is, it burns from carbon to carbon monoxide and from carbon monoxide to carbon dioxide, and in a coal flame the blue flame that you see is that reaction; but we have hydrocarbons in the gas which we are burning in a domestic or any other appliance using manufactured gas, other than the carbon monoxide which we burn—we have the hydrocarbons in the gas itself. As well as methane, we have the illuminants. They are called illuminants because they are absorbed and tested in a certain manner in the analysis method. I do not mean the napthalene distillants. No na-thalenes in gas. We do not let them stay in at all. If we run too high temperature in a water gas plant, we manufacture napthalene and choke up all the mains. When I was a gas engineer for the Public Service Commission in the Second District, I had charge myself, of a staff of men we [fol. 790] called inspectors who tested the gas for quality, that is, calorific value, in each city under the jurisdiction of that Commission whether the output was in excess of 20,000,000 cubic feet per year. The small companies were not required to furnish calorimeteric, but we furnished and took them around and tested on the spot with our own instruments. The larger companies we tested with their instruments and calibrated them. I also had charge in that work of the purity testing of gases and other things. So that I received complaints from consumers even where B. T. U. gas was used, as to the service, but not necessarily of the heating value. The majority of complaints are always due to pressure—slow meters, and so forth. I had 585 standard in my investigation to deal with. These inspections I speak of were not their result of complaint but they were made as periodical check ups by the State to determine whether the gas companies were making gas, according to the standard required by the statute, and prac-

tically all complaints as to quality were initiated by the commission of its own motion against companies who did not meet the requirements laid down. I could not say that it necessarily followed when the companies fell down in the quality of the gas furnished as prescribed by the Commission, the consumers made no complaint whatever. Every time I have handled a complaint before a Commission, if [fol. 791] it has been drawn up by a lawyer, whether in connection with rates, he has always drawn into it that particular section of the Public Service Commission Act which related to quality, and we generally made the investigation as to quality and found there was no reason for that complaint.

Exhibit 77 that I have introduced shows the heating value fixed for entire states by different public utility commissions in those states. And Exhibit 78 is the same thing but in reference to cities. As fixed by the State Commission or by an Ordinance or the municipal authorities. I do know that these States or cities set forth here furnish something besides carburetted water gas. I know that those are a pretty good cross-section of the United States, and I know that the total manufacture of gas in this country is both water gas and coal gas, and in some cases one or the other. The water gas in American is in the majority. I know the companies that furnish gas in any of the cities now set forth in these exhibits, furnish a mixed gas or a natural gas and either coal gas or water gas, but I believe the same standard should be fixed when a natural gas is being furnished as when a coal gas or water gas is being furnished. All my references today have been to the manu- [fol. 792] facture of gas. I specifically made that clear. If some of these cities are furnished with a liquid gas of natural gas and water gas, then what their standard is would have no relevancy to this case. I have not taken that into consideration at all. If there are any natural gas mixtures in this sheet, they might just as well be ruled out as far as their evidence goes, from my point of view. Exhibit 78, in Los Angeles, 750. That is a mixed natural gas. As to how you would use this exhibit with any benefit if you did not know which of these cities are furnished with a natural gas or a mixed natural gas,—that is a just criticism, but I could very easily furnish an exhibit that would cor-

rect that point. If I had picked this out, I would have had a hand-picked exhibit. I took our record right as it was and had it copied. There were no advantages to domestic consumers in the use of a 650 gas over a 537 gas. If the domestic consumers are using a flat open burner for illumination, a gas of a high B. t. u. content would not necessarily be more beneficial to them. I will very frankly say, without being contentious at all, that the whole of my gas life, and I have been in it all my business life—I have never yet been able to find that relation, and there is no relation. An [fol. 793] ordinary gas of 650 B. t. u. would have a higher candle-power than a gas of 537 or 540 B. t. u. because we could make a gas of that mixture with hydrogen and other gases, but you would have no candle-power. As to gas manufacture in New York City, I do not like to label it, but I have not been able to find any relationship. Assuming the gas is manufactured the way it is manufactured in New York City. As to whether a gas of 650 B. t. u. content would have a higher heat content than a gas of 537 B. t. u. content, it might be one way or the other and assuming that that stove that has been referred to was adjusted for 650 gas, and that the company were attempting to make a 650 gas, and to keep as close to that standard as practicable, and assuming that that Exhibit 74, was adjusted for a 540 gas, Exhibit 74, in my opinion would be a most dangerous thing to use. I cannot answer that directly as to whether it is more a menace to the users of gas than the 650 gas used in properly adjusted ranges, because this is a menace anyway it is considered—Exhibit 74 under any conditions, and ought not to be on the district of any company. There aren't any words—technical words—strong enough to describe the danger of that type of appliance. Outside of its description, there is no cock there, and you might knock that [fol. 794] off, thus you will read the next day that somebody was asphyxiated. I think it would be more dangerous if gas supplied had a high B. t. u. content rather than a low, for the reason that with this type of air mixture it would be practically impossible to get complete combustion and you would be sure to get some carbon monoxide, acetylene and other gases in the resultant mixture. If you have a high candle-power gas, you have a high heat content in the gas. With a rich gas, if you have a high candle-power gas,

you have a high heat content in the gas. That is generally true, the higher the candle-power the higher the heat content. My opinion is that if a 650 gas was furnished, the company would have lots of complaints from consumers. And if those complaints resulted in litigation, it would affect what you might call the goodwill of the company, which would be reflected in their going value.

Redirect:

I do not think in actual service, a mantle burner will [fol. 795] work as efficiently with a high B. t. u. gas as with a low B. t. u. gas. It is very hard to adjust the mixture and keep the mantle from smoking. With a high B. t. u. gas like 650, persons who were securing their illumination by mantle burners under 650 B. t. u. would not get as satisfactory service as they might. It is very difficult to get a mantle burner correctly adjusted with a high B. t. u. value gas. I presume, in a territory, where there is electric service and people are using gas for illumination through the medium of the mantle burner, they would be likely to go over to the electric service if they were getting poor service. Various manufacturers of gas consuming appliances made inquiry as to the quality of gas furnished in a certain territory. I furnished them with information with regard to that from our files and from the information contained on Exhibits 77 and 78, I understood what was the purpose of their inquiry as to the service. The general understanding we had of it was that information, together with the pressure requirements set by the Commission generally, in the same order, would enable them to determine the correct size orifice for the burners in the appliances they were going to sell in their territory. It is particularly applicable to the Radiantfire heaters. I don't recall whether Crane & Company have made inquiries; they are large manufacturers of gas ranges. I do not remember whether they have used it [fol. 796] or not. We furnish this information anyhow, in our own publications. It might have been used that way without their having written us directly. There are manufacturers of gas consuming appliances that distribute their products widely throughout the country. As I understand it, they would not make a different burner. I think, if they

have the information available, they will endeavor to furnish the orifices. In my opinion as an engineer who specialized on this line of work, including its utilization, I think that material would be invaluable to a manufacturer in designing the burner or the burner ports for appliances to be sold in a given territory, and of my knowledge I know I have furnished it to manufacturers for that purpose. I have assisted in designing burners. I designed a burner for New York City. It was designed specifically for the B. t. u. value of the gas and the pressure prevailing in the district. The orifice was designed specifically on those requirements with half-inch margin of safety. As to my experience as a designer being limited to that experience with the New York Company, I would say in specific instances, yes, but generally, no. The operation of that particular laboratory was such that a manufacturer submitted his appliances for investigation. We investigated them, and if they were not safe, we pointed out to him how they could be made safe, and in many cases the manufacturer adopted [fol. 797] our suggestions, which became specifications as far as the Consolidated Gas Company was concerned, and sold his appliances nationally, following out the general lines of design that we determined by experimentation. At the time I was in that designing work and consulted by manufacturers, they did not bring to my attention the fact that their appliance was going to be used where there was a different standard. It was brought out specifically only for the New York service. I never worked as a designing engineer except for the New York Company.

Recross:

I do not say that you would have to design a special appliance for each kind of gas, in Plaintiff's Exhibits 77 and 78, but it would be very desirable, if we could do so, to get the maximum efficiency. As a matter of fact, it is not being done, it — not done for every particular kind of gas, because there is a range over which a burner will work. On Plaintiff's Exhibits 77 and 78—as to the apparatus that I designed being suitable for each one of those extremes, so much of that is a matter of opinion, but in my judgment, if there was a range of 80—if the appliance was set for the middle, the mean, and we got a very high

[fol. 798] grade appliance, we might be able to stretch a fair distance each side of that mean with satisfaction. I was employed by the Consolidated Gas Company at a time when 22 candle power gas prevailed in New York City as a standard. There were a large number of Welsbach gas mantles used at the time that I was thus employed. I do not know anything about the lighting end of it. I had no connection with it. I know they were used. I also knew that New York had at the same time the largest percentage of flat flame burners, I believe, in the United States at that time. I do not know any facts that would indicate that there was any necessary change since that time with reference to flat flame burners. I have no information on the lighting end of it.

[fol. 799] Kings County Lighting Company

Brooklyn, N. Y., April 1, 1924.

JOHN H. DUNCAN

Cross:

My direct testimony indicates that in preparing my estimate of the cost of reproducing the main system of the plaintiff I used the weights of the American Gas Association. I have prepared an estimate here, which is Plaintiff's Exhibit No. 36. In making that estimate I got the prices, that is, I got a letter in my files from the United States Cast Iron Pipe & Foundry Company, giving me the prices that they would furnish the pipe for. I had other prices that the Bartlett Hayward Company furnished me, as sort of a guide, meaning the company with which Colonel Miller is connected. I don't know whether they deal in pipe. I did not do any shopping in order to find out whether or not, in purchasing this quantity of pipe, meaning the various sizes of pipes, to see whether I could get any better prices than contained in the letter from the United States Cast Iron Pipe & Foundry Company, other than, as I stated what Colonel Miller furnished me.

I cannot give the weight per foot of 3 inch pipe such as is specified in my estimate now in evidence, marked Plain-

tiff's Exhibit No. 36 nor can I give the weight per foot of [fol. 800] 4 inch pipe. As to the 6 inch pipe, not exactly, I can approximately. I cannot give the weight per foot of the 8 inch pipe nor the 12 inch pipe.

In determining the weight of given sizes of pipe, the requirements of the American Gas Association prescribe the weights per foot.

I use short tons in making this determination in the last column of Sheet No. 2 of Plaintiff's Exhibit No. 36 "Cost of Pipe and other materials per lineal foot," that is, tons of 2,000 pounds. Indicating column 9 now, of Sheet 2 of Plaintiff's Exhibit No. 36 "Cost of Pipe and Other Materials Per Lineal Foot" includes the cost of the pipe, the lead and the yarn, the lumber required for blocking, sheeting, barricades and all material that enters into the work. The cost of labor is not indicated on that sheet. It is on sheet 3. I have in my work as general contractor purchased pipe. The last considerable purchase of pipe such as included here in the first column of Sheet 2, that I made was in 1922. That was for the Kings County Lighting Company. I have not made any actual purchases of pipe of these sizes indicated in Column 1 of Sheet 2 of Plaintiff's Exhibit No. 36 since 1922. About June 1, 1923, the cost of pipe of the [fol. 801] quality that I use in making this estimate was higher than January 1, 1923.

I don't remember the date of the letter that I received from the United States Cast Iron Pipe & Foundry Company, giving the prices. I don't know whether or not the weights of pipes used in the gas industry for the purpose of constructing gas mains was lighter or heavier twenty years ago than that used to-day. I don't know if there was a kind of pipe about twenty years ago called light-weight pipe that the gas companies used in constructing their mains systems at that time. I am familiar with the magazine known as The Iron Age. In that Iron Age there are various quotations given from time to time as to the price of pipe of the kind that I used here in making my estimate as contained in Plaintiff's Exhibit 36. I never investigated that magazine to determine the price of pipe as quoted at the present time. I do not consider the quotations in the Iron Age reliable information for the purposes of our business. I go to the manufacturer of pipe or any other com-

modity that I am in the market for for prices. I have not bought any cast iron pipe since the early part of 1922. [fol. 802] I am not controlled in making your estimate absolutely by the determination of the American Gas Association as to the weights per lineal foot of pipe that they prescribe. I am using the weights that they prescribe in my estimate here marked Plaintiff's Exhibit No. 36. But an additional factor I introduce so far as the weight only is concerned, that they do not have in the American Gas Association specifications which comes from my experience in laying pipe, a certain amount of pipe is lost and wasted. I have used 3 per cent. for that. Aside from this factor of 3 per cent, I am controlled absolutely and wholly by the specifications of the American Gas Association. I accept that figure absolutely as to weights. I don't think I did in any of the sheets of Plaintiff's Exhibit No. 36, indicate the additional 3 per cent to the weight of the pipe. In other words my 3 per cent is included in my other figures here. That is, in order to determine, for instance, in Column 9 what the cost of pipe is per foot, per lineal foot, you must make a deduction in order to reach the absolute weight per foot of pipe used by me of 3 per cent. But that is not disclosed here in any of the sheets of Plaintiff's Exhibit No. 36. [fol. 803] In making this reconstruction of Plaintiff's main system, I would not think it possible to assume that the weight per foot of cast iron pipe of a given diameter is uniform. For instance, assuming that the weight per lineal foot of 3 inch cast iron pipe is 13 pounds, if you cut the 3 inch pipe anywhere, cut a 12 inch length, it would not have 13 pounds of weight. You would have exactly 13 pounds for every foot of pipe in the trench. Take a carload of 6 inch pipe, for example. They are all 12 feet long, and they might vary 20 pounds in weight.

Q. Do you know what the process is of making cast iron pipe now?

Mr. Moran: I object to that as wholly immaterial and irrelevant. We are to assume something in this case, that cast iron pipe is made and sold—what has that got to do with this case?

Mr. Moran: Exception.

Q. Do you know, Mr. Duncan?

A. There is more than one process, yes, sir.

I do not take a magazine known as the Gas Age, but I know there is such a thing. I never had recourse to the [fol. 804] weights per linear foot of various diameters of pipe such as used in Exhibit No. 36 from that magazine. In my construction of this exhibit, I did not assume that the plaintiff furnishes us with the pipe as we need it for the purpose of building these mains system and reproducing it. I bought the pipe myself. That was the assumption. In a contract of this size a large part of the pipe used in the work of construction would be taken from the railroad cars or from the dock directly to the place where it is used. Assuming that this job was to be done in two years, there would be some cost involved in handling the pipe at some storage point on the plaintiff's property. I could not answer what proportion of the entire quantum of pipe used in this reproduction would be stored. I took that into consideration in preparing this estimate as to cost of storage. The cost of that would be in the cost of labor shown on page 3 of Plaintiff's Exhibit No. 36. If I were to take the pipe used in making the mains system of the plaintiff from the storage place at 65th Street and Ninth Avenue, I would in my figures have the cost of transportation from that point. Ordinarily when the pipe is sold to a user such as a general contractor on work of this kind, so far as delivery is concerned, the prices quoted invariable, in my case, have been freight allowed to Brooklyn. By alongside I mean whichever way the shipper chooses to handle it; either at a dock or railroad siding. If I were ordering pipe [fol. 805] in these quantities necessary to reproduce the plaintiff's mains system, I would order the entire quantum of pipe necessary to reconstruct this mains system at one time. I would have to do that to get the price. For instance, it would take two years to reproduce this mains system. In requesting delivery of pipe, I would request the company to scatter it over a period of a year and a half. I could not say whether that fact would in any way affect the price of the pipe when I came to order. That would not be for me to determine. I would have to divide that total number of tons of pipe into 20 parts so that I would get every month for 20 months so much pipe to complete the job

in two years. I imagine it would be a very great convenience to the seller to avoid the necessity of delivering the entire quantum of pipe at once. I don't know. I don't make pipe, so I don't know just what different things they get up against that govern their deliveries. It could readily be seen by any pipe man or by any ordinarily reasonable man that it would be a great advantage not to require delivery of an order of this size at once. I think it would be impossible for them to do it, but I don't think I could claim an advantage by reason of that fact and secure better terms from the pipe seller than I otherwise would. That has been [fol. 806] true that ordinarily pipe manufacturers during winter months, make a very substantial concession in the price if you accept deliveries during winter months. It was true in 1922 and 1923, the winter of 1922-23.

Column 6, page 2 of Exhibit No. 36 of the Plaintiff's; that column is headed "Cost of Other Material Per Linear Foot"; that includes the lead and yarn and lumber and other materials that enters into the work. On this item in the second column set opposite the 4 inch pipe, I have the figure .094. That means 9.4 cents.

Our system of accounting in the office is that we put all material under one heading and all labor under another heading and then we divide the material into pipe, because that price fluctuates, and we divide it into other materials, and then we take the total number of feet of pipe that we laid during that season's contract and divide the figure into the total number of dollars, the sum of these different items and we get the different costs as set forth in this exhibit. That is the way we arrive at this figure. Our method includes a consideration of the cost of lead.

Q. Now, I am going to begin again, Mr. Duncan, and ask you to criticise the figures that I have here, the unit figures per foot of lead pipe laid. The figure that I have here for lead, as I have said before, referring now to the 4 inch diameter size is .0489; yarn .0032; wood blocks .0069; fuel and other incidentals .0016. Now, that gives a total of .06 [fol. 807] for 4 inch pipe per foot laid, and your figure is .094. Will you please, from the figures that I have given you, make any criticism of them or any differentiation that you can?

Mr. Moran: I object to that. That is not proper cross examination.

The Master: Objection overruled.

Mr. Hyatt: I would have to take an exception to that. This is most extraordinary; the man is not able to give me any of his figures in detail, and I give him some figures and ask him to criticise them. If he were able to furnish me with the details, your Honor, I would not take this method of getting after the facts, but he is not able to furnish me with any of his details.

Mr. Moran: You have not asked him for the details yet.

Mr. Hyatt: I asked him to criticise it any way, or differentiate or show that those figures are wrong.

The Master: Objection overruled.

Mr. Hyatt: Exception.

Q. Mr. Duncan, can you tell me with respect to any of the figures that I have just given, in what respect they differ from your own figures as to the same items.

Mr. Moran: I object to that as not proper cross examination.

The Matser: Objection overruled.

Mr. Hyatt: Exception.

[fol. 808] The Witness: I cannot tell at this time what I have set out in my estimate here with respect to the 4 inch pipe, how much I charge for lead per foot of pipe laid, neither can I tell at this time how much I charged for yarn per foot of pipe laid. I will give Counsel the cost as per my estimate, per foot of pipe laid, of fuel and other incidentals, but I cannot at this time.

Q. Mr. Duncan, those figures being missing, how can any check be made of your estimate here as to the details?

Mr. Moran: That is not for the witness to say how it can be checked. It is argumentative.

Mr. Hyatt: I am asking for a matter of fact, if he knows.

Mr. Moran: The objection is made.

The Master: Objection sustained.

Mr. Hyatt: Do you object to that question?

Mr. Moran: Oh, yes; it is so unfair.

Mr. Hyatt: Exception.

Q. Is there anything in your estimate that involves the cost of pumping?

Mr. Moran: Pumping what? I object to that as vague. I don't see how it has got anything to do with it.

The Master: Objection overruled.

Mr. Moran: Exception.

A. Any pumping required is included in the estimate.

I gave a figure as to the cost of labor, unskilled labor, [fol. 809] of 44 cents per hour in 1921. I think that is the figure, 44 and 4-9ths would be the figure. I do not remember what the cost of labor was per hour in 1922, the same kind of labor. I estimated 60 cents an hour for common labor in my estimate of the cost of reproducing the distribution system of the plaintiff. I haven't got the figure right now of what I actually paid for the same kind of labor during the year 1922. During the year 1923 I paid 60 cents an hour for the same kind of labor. That was unskilled labor. I think 50 cents per hour was the price I paid up to June 7, 1923. I wrote a letter to the plaintiff dated June 11, 1923, wherein I stated that I paid for laborers of this kind 50 cents an hour and that it was to be increased on June 7th to 62 1/2 cents per hour. I think those were the figures. I do not know what the gas company, meaning this plaintiff was paying for ordinary labor prior to June 1st, 1923.

JOHN H. DUNCAN

Redirect:

I will explain that letter. My contract with the gas company was a certain price per foot of pipe laid based on the, at that time, price of labor, and the understanding was that if it was necessary to increase the price of labor I would get an increased price per foot, and that letter was notifying the gas company of the necessity of paying an [fol. 810] additional cost per hour for labor. That is in my work of laying pipe for this company in 1923. June 11th 1923 was the date of that letter. I think on June 11th I had not been retained to make this valuation of the distributing system. Not until quite some time after that. That letter had nothing to do with this work here at all. That

was in the ordinary course of business. In my estimate here I used the length of pipe given to me by the company. I take no responsibility for that, but the quantity of pipe in tons I ascertained having been given the length of pipe in feet by applying the specifications of the American Gas Association. As to the American Gas Association specifications, a layman could look at them and find out how much, on the average, a foot of 4, 6 or 8 inch pipe weighs; it is stated right there. Any one of the clerks in my office can do that, and given the length of feet, the tonnage is obtained by applying that factor to it. That is the way I did this but I added 3 per cent here because my experience teaches me that there is a certain wastage, a certain loss; that is, you have to buy—you might put it this way 103 feet of pipe to lay 100 feet of main on an average. I added the 3 per cent to the footage and then took the pounds on that, multiplied that by the pounds per foot.

With reference to the wages, I have applied or used the rate of 60 cents an hour for common labor. That is what I paid in 1923. I began paying that on the 7th of June, I think. I was not the only one that was paying it; there were others. I know the prices paid generally for common [fol. 811] labor in *in* the Borough of Brooklyn in 1923. Might I just explain what governs those things. It has been my experience that when street works starts, repaving streets and paving streets, that the prices the asphalt and paving people pay for labor is what governs, because they go out in the spring of the year and require a large force of men. They started in by paying 60 cents an hour, and I had to increase my men from 50 cents to 60 cents in order to hold the men. That is what has been my experience that governs the cost of labor. They get out during May, usually, April and May. I don't think this price of 60 cents prevails in April and May. They do not start in any higher than they have to in order to get men, but it seeks a level, it reaches a level along in May or June, and the level it reached last year,. 1923, was 60 cents an hour. That is not temporary work, asphalt laying. That is pretty steady throughout the season. That is, throughout the summer, and well into the frost throughout the fall and then it usually quits.

JOHN H. DUNCAN

Recross:

In those parts of my exhibit, being Plaintiff's Exhibit No. 36, containing estimates for labor and estimates for other material, I adopted the expenses our company was put to for these items in laying pipe for the plaintiff. Those are not the result of what it actually cost us in 1922. It is based on our costs for 1922. It would be increased by the [fol. 812] increased cost of labor in proportion to what the labor item is to the whole. I increased the labor item to correspond to the increase in labor in 1923 over 1922. The costs I used were the actual costs to my company and not what I charged the Kings County Lighting Company. On June 1, 1923 I was not paying my common laborers the amount that I use in this estimate, so the amount that is contained in this exhibit was increased as to labor over what my company was actually paying on that date. For the prices of pipe I adopted the costs of June 1, 1923. I made this exhibit in July or August, possibly September, I couldn't say definitely. I made an investigation at that time to see what the costs of pipe were as of that date, only as I stated, in getting a price from the United States Cast Iron Pipe Company. I asked them for prices as of June 1, 1923. I did not find out what the prices were in September or August when I made this exhibit. This letter that I got from the United States Cast Iron Pipe & Foundry Company, gives prices of all these diameters of pipe that I have indicated here on Sheet 2 of Plaintiff's Exhibit No. 36. The only one that would be missing would be the 24 inch, I think. I have not looked at that in quite some time, but I think we would not have asked for a price on the 24 inch. Possibly we did. That is, as indicated on Sheet 2 of Plaintiff's Exhibit No. 36, and I used, in preparing the estimate, the prices indicated in that letter with reference to each and every one of these diameters except the diameter of 24 inches, that is, I would not be positive about that exception. The rest is true.